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# Experiments on Thinning Peaches

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# EXPERIMENTS ON THINNING PEACHES

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## INTRODUCTION

The experiments which form the basis of this report were conducted at Wooster in 1931 with Elberta and 11 other varieties of peaches, in 1932 with Elberta and seven other varieties, and in 1933 with Carman. They have shown certain effects of thinning both (a) in the current year of the work, when a heavy set of fruit followed a year in which the trees did not bear a crop, and (b) in the succeeding year, when the set of fruit on various trees differed strikingly, due to the influence of the previous year's treatment. The results concerning the effects on the succeeding crop are associated with the fact that each tree receiving a certain thinning treatment in the first year of the work received a corresponding treatment the next year. During 2 consecutive years, the same Elberta tree was left unthinned, and other trees were thinned early or late to give spacings of 4, 6, or 8 inches.

One peach orchard at the Ohio Experiment Station is known as the "Elberta Orchard"; another, as the "Variety Orchard". The former consists of 45 trees, which were set out in the spring of 1926. In 1929 (the third year), the yield averaged between ½ and ¾ bushel per tree. In 1930, no crop was produced in either orchard, due to bud killing. The trees in the Variety Orchard (usually two trees of each variety) were mostly 3 years older than the Elberta trees and were also thrifty, but their condition was not quite so vigorous as in the case of Elberta. The trees in both orchards have been treated alike each year with respect to fertilizer, borer control, and various cultural practices (except thinning).

In 1931, during April, May, August, and September, the amount of rainfall was above that for the 44-year average (1883-1928), but during June and July, the months when the thinning was done, it was below the average by 0.51 inch in June and by 1.09 inches in July. It is to be recalled that the summers of 1930 and 1931 were characterized by pronounced drouth. The mean temperature in July and until picking was also higher than that for the 44-year average. Other weather records for the years in which the thinning work was conducted at Wooster are given in Table 1.

**TABLE 1.—Mean Temperature and Precipitation at Wooster***

| Year | April | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|
| Mean temperature, degrees F. | | | | | | |
| 1883–1928 (44-year average) | 48.1 | 58.4 | 67.5 | 71.5 | 69.6 | 63.7 |
| 1930 | 51.0 | 61.1 | 69.0 | 73.9 | 70.5 | 66.7 |
| 1931 | 48.4 | 57.4 | 67.7 | 75.6 | 71.8 | 68.4 |
| 1932 | 46.5 | 58.8 | 68.9 | 72.0 | 70.8 | 64.8 |
| 1933 | 50.6 | 61.8 | 72.4 | 73.8 | 70.6 | 67.2 |
| Precipitation, inches | | | | | | |
| 1883–1928 (44-year average) | 3.03 | 3.86 | 4.00 | 4.06 | 3.55 | 3.32 |
| 1930 | 2.23 | 1.59 | 2.86 | 1.71 | 2.64 | 2.53 |
| 1931 | 4.10 | 4.45 | 3.49 | 2.97 | 4.68 | 3.48 |
| 1932 | 2.55 | 1.93 | 3.44 | 3.14 | 2.01 | 1.93 |
| 1933 | 3.47 | 4.77 | 1.67 | 1.73 | 3.85 | 4.23 |

*Courtesy C. A. Patton, in charge of the weather records at the Ohio Experiment Station.

In reporting the work at Wooster, early thinning refers to thinning done near the middle of June (just before or soon after the start of the "June drop"), and late thinning refers to that done near mid-July (soon after most of the June-drop peaches had fallen). The early thinning, considering all varieties, extended over a period of about 3 weeks in 1931, due to insufficient help; in certain respects this proved fortunate in interpreting the results. It was originally planned to conduct the late thinning somewhat later than it was done, but a number of factors precluded this. The actual dates of thinning are given in Table 2. Width and length dimensions of the developing fruits at the time of thinning in 1931 and 1932 also are shown in Table 2. It should be noted that the earlier in June the thinning was done, the greater was the difference in dimensions of the resulting fruits from early to late thinning dates.

**TABLE 2.—Dimensions of Developing Fruits at the Time of Thinning**

| Variety | Tree No.* | 1931 | | | 1932 | | |
|---|---|---|---|---|---|---|---|
| | | Time of thinning | Width | Length | Time of thinning | Width (two directions) | Length |
| | | | *In.* | *In.* | | *In.* | *In.* |
| Elberta | 23 | Unthinned | ..... | ..... | Unthinned | ..... | ..... |
| | 19 | June 18 | 1 | 1 7/16 | May 31 | 3/4 — 5/8 | 1 1/8 |
| | 42 | June 18 | 1 1/8 | 1 1/2 | June 2 | 3/4 — 5/8 | 1 1/8 |
| | 2 | July 16 | 1 1/2 | 1 7/8 | July 19 | 1 1/4 —1 1/2 | 2 |
| | 3 | June 12 | 7/8 | 1 1/4 | May 31 | 3/4 — 5/8 | 1 1/8 |
| | 7 | June 12 | 7/8 | 1 1/4 | May 31 | 3/4 — 5/8 | 1 1/8 |
| | 28 | June 16 | 1 | 1 3/8 | May 31 | 3/4 — 5/8 | 1 1/8 |
| | 30 | June 16 | 1 | 1 7/16 | June 1 | 3/4 — 5/8 | 1 1/8 |
| | 34 | June 16 | 1 | 1 3/8 | June 1 | 3/4 — 5/8 | 1 1/8 |
| | 4 | July 18 | 1 1/2 | 1 7/8 | July 19 | 1 3/8 —1 5/8 | 1 1/8 |
| | 21 | June 17 | 1 | 1 7/16 | June 2 | 3/4 — 5/8 | 1 1/8 |
| | 43 | June 18 | 1 1/8 | 1 1/2 | June 2 | 3/4 — 5/8 | 1 1/8 |
| | 27 | July 27 | 1 1/2 | 1 7/8 | July 19 | 1 7/16—1 3/4 | 2 1/16 |
| J. H. Hale | 27 | June 25 | ..... | ..... | ..... | ..... | ..... |
| | 28 | July 24 | 1 3/8 | 1 3/4 | ..... | ..... | ..... |
| Kirchner | 2 | June 8 | 5/8 | 7/8 | ..... | ..... | ..... |
| | 3 | July 21 | 1 5/16 | 1 5/8 | ..... | ..... | ..... |
| Salberta | 16 | June 20 | 1 3/16 | 1 1/2 | June 3 | 3/4 — 7/8 | 1 1/8 |
| | 18 | July 24 | 1 3/8 | 1 3/4 | July 12 | 1 1/2 —1 3/4 | 1 15/16 |
| Brackett | 8 | June 10 | 1 1/16 | 1 1/8 | ..... | ..... | ..... |
| | 7 | July 22 | 1 3/8 | 1 13/16 | ..... | ..... | ..... |
| Early Elberta | 14 | June 20 | 1 1/16 | 1 1/2 | June 3 | 3/4 — 7/8 | 1 1/4 |
| | 13 | July 23 | 1 1/4 | 1 3/4 | July 12 | 1 1/8 —1 1/2 | 1 3/4 |
| New Prolific | 35 | June 25 | 1 1/16 | 1 7/16 | June 4 | 3/4 — 7/8 | 1 1/16 |
| | 36 | July 27 | 1 3/16 | 1 1/2 | July 12 | 1 5/16—1 7/16 | 1 5/8 |
| Banner | 29 | June 25 | 1 1/8 | 1 3/8 | June 3 | 3/4 — 7/8 | 1 1/16 |
| | 30 | July 25 | 1 3/16 | 1 7/16 | July 12 | 1 1/4 —1 3/8 | 1 1/2 |
| Smock | 31 | June 25 | 1 1/8 | 1 3/8 | June 4 | 5/8 — 3/4 | 1 |
| | 32 | July 27 | 1 1/4 | 1 1/2 | July 12 | 1 1/8 —1 3/8 | 1 5/8 |
| Fitzgerald | 25 | June 24 | 1 1/8 | 1 5/16 | June 3 | 7/8 — 15/16 | 1 1/16 |
| | 26 | July 24 | 1 3/16 | 1 7/16 | July 12 | 1 7/16—1 9/16 | 1 7/8 |
| Bronson | 4 | June 9 | 9/16 | 1 3/16 | ..... | ..... | ..... |
| | 5 | July 22 | 1 1/4 | 1 3/8 | ..... | ..... | ..... |
| Carman | 96 | ..... | ..... | ..... | June 7 | 7/8 —1 1/16 | 1 1/8 |
| | 98 | ..... | ..... | ..... | July 12 | 1 3/8 —1 1/2 | 1 11/16 |

*The tree numbers are listed here in the order of later discussion.

In 1932, R. B. Neiswander, of the Entomology Department at the Ohio Experiment Station, in his studies on the control of the Oriental fruit moth, obtained the following data from week to week on 50-peach samples of Elberta at Gypsum, Ohio: size (average of three diameters) on June 6 was 0.915 inch. The increases in inches were as follows: June 13, 0.316; June 20, 0.211; June 27, 0.156; July 7, 0.018; July 11, 0.020; July 18, 0.031; July 25, 0.043; August 1, 0.059; August 8, 0.044; August 15, 0.079; August 22, 0.041; August 30, 0.253. The fruit was picked commercially on September 3, 4, and 5. It will be noted that (a) there was a rapid growth at the early dates, (b) the slowest rate of growth occurred in July, and (c) the rate of growth increased markedly a few days before picking.

**TABLE 3.—Dates of Peach Bloom at Wooster in Years of the Experiments**

| Variety | 1931 | | | 1932 | | |
|---|---|---|---|---|---|---|
| | First bloom | Full bloom | Last bloom | First bloom | Full bloom | Last bloom |
| Elberta* | April 21 | May 1 | May 5 | April 22 | April 27 | May 1 |
| J. H. Hale | April 22 | May 2 | May 6 | April 24 | April 29 | May 2 |
| Kirchner | April 29 | May 4 | May 6 | ..... | ..... | ..... |
| Salberta | April 29 | May 4 | May 7 | April 22 | April 27 | May 2 |
| Brackett | April 25 | May 3 | May 5 | ..... | ..... | ..... |
| Early Elberta | April 22 | May 1 | May 6 | April 22 | April 26 | May 1 |
| New Prolific | April 23 | May 1 | May 4 | April 24 | April 29 | May 3 |
| Banner | April 22 | May 2 | May 6 | April 24 | April 29 | May 2 |
| Smock | April 28 | May 3 | May 6 | April 23 | April 27 | May 1 |
| Fitzgerald | April 25 | May 1 | May 4 | April 22 | April 27 | May 1 |
| Bronson | April 25 | May 3 | May 6 | ..... | ..... | ..... |
| Carman | ..... | ..... | ..... | April 22 | April 26 | April 30 |

*The Elberta trees were mostly 3 years younger than the trees of the other varieties.

## GUIDE DISTANCE BETWEEN FRUITS COMPARED WITH THE ACTUAL DISTANCE AFTER THINNING

The spacing between peaches may be considered from at least three viewpoints:

*(a) The nearest distance between two peaches as they hang on the tree, regardless of their points of origin.* This viewpoint, although it has been useful in promoting thinning practice among growers, fails to take into account the fact that a distance across space is of little, or secondary, significance in the competition of two given peaches for food, mineral nutrients, and water.

This measurement does not provide a reliable index for use in experimental work; in fact, measurements made between many of the fruits at thinning time will vary considerably from those made between the same fruits later in the season.

*(b) The distance along the wood between two consecutive fruiting points of peaches on the same branchlet.* This spacing is probably the predominating one referred to in the extensive literature on peach thinning, but this measurement is subject to the criticism that it fails to include a fairly high proportion of spacings between fruiting points of peaches which are sufficiently close to compete directly for food, mineral nutrients, and water.

*(c) The distance described in (b), plus that between the fruiting point of a peach on one branchlet to the nearest peach on an adjacent branchlet, measured along the wood and around the crotch in V-shaped manner, within a reasonable range.* This is considered to be a fairly good index of spacing for use in experimental thinning work, and, although by no means perfect, it permits certain factors to be emphasized more clearly than can be done by the use of leaf-to-fruit ratios or other indices under the conditions which prevailed in conducting this experimental work.

While thinning Elberta to guide distances of 4, 6, and 8 inches, respectively, at Wooster in 1931, a record was made of the actual spacing of the fruits after thinning for each of the three guide distances on a tree thinned early and on one thinned late, Table 4. The fruits were spaced as closely as possible to the guide distance, and the actual spacing between the peaches remaining was carefully measured as the work progressed throughout each tree.

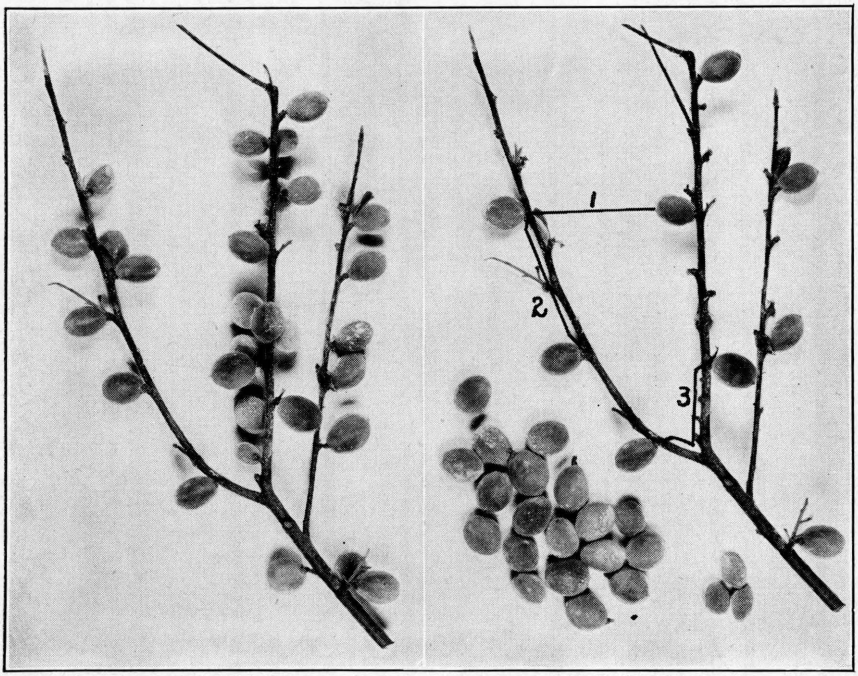


**Fig. 1.—Unthinned (left) and thinned to 6-inch spacing (right). Explanation of the numbers is given in the text, (*a*), (*b*), and (*c*) on Pages 5 and 6**

The attempts to thin developing fruits to a definite guide distance provide the following information (the features probably would be even more marked in the case of lighter crops):

## TABLE 4.—Frequency of Spacings Throughout Elberta Trees After Thinning to 4, 6, and 8 Inches, Respectively*

| Spacing between thinned peaches | Measurements between peaches | | | | | | Measurements between peaches | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | On same branchlet | | On different branchlet | | Total | | On same branchlet | | On different branchlet | | Total | |
| In. | Pct.† | No. | Pct.† | No. | Pct.† | No. | Pct.† | No. | Pct.† | No. | Pct.† | No. |
| **4-inch thinning** | | | | | | | | | | | | |
| | June 18, Tree No. 19 | | | | | | July 16, Tree No. 2 | | | | | |
| 3 | 5.9 | 153 | 0.2 | 5 | 6.1 | 158 | 2.3 | 43 | 0.2 | 4 | 2.5 | 47 |
| 4 | 26.2 | 682 | 10.8 | 277 | 37.0 | 959 | 21.7 | 399 | 9.9 | 182 | 31.6 | 581 |
| 5- 6 | 9.4 | 242 | 9.8 | 255 | 19.2 | 497 | 7.4 | 137 | 15.6 | 288 | 23.0 | 425 |
| 7- 8 | 2.6 | 68 | 10.6 | 268 | 13.2 | 344 | 1.1 | 31 | 13.0 | 240 | 14.1 | 271 |
| 9-10 | 1.0 | 26 | 7.0 | 183 | 8.0 | 209 | 0.4 | 7 | 8.7 | 161 | 9.1 | 168 |
| 11-12 | 0.5 | 14 | 4.8 | 123 | 5.3 | 137 | 0.3 | 5 | 8.4 | 155 | 8.7 | 160 |
| 13-14 | ..... | ..... | 2.7 | 68 | 2.7 | 68 | 0.1 | 2 | 3.5 | 66 | 3.6 | 68 |
| 15-16 | ..... | ..... | 2.6 | 67 | 2.6 | 67 | ..... | ..... | 1.9 | 36 | 1.9 | 36 |
| 17-18 | ..... | ..... | 1.8 | 47 | 1.8 | 47 | ..... | ..... | 1.4 | 26 | 1.4 | 26 |
| 19-20 | ..... | ..... | 1.7 | 43 | 1.7 | 43 | ..... | ..... | 1.3 | 24 | 1.3 | 24 |
| 21-22 | ..... | ..... | 0.8 | 22 | 0.8 | 22 | ..... | ..... | 0.8 | 15 | 0.8 | 15 |
| 23-25 | ..... | ..... | 1.1 | 30 | 1.1 | 30 | ..... | ..... | 0.7 | 13 | 0.7 | 13 |
| 26-30 | ..... | ..... | 0.2 | 4 | 0.2 | 4 | ..... | ..... | 0.2 | 4 | 0.2 | 4 |
| 31-36 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.1 | 2 | 0.1 | 2 |
| | 46.0 | 1185 | 54.0 | 1405 | 100 | 2590 | 34.0 | 624 | 66.0 | 1216 | 100 | 1840 |
| **6-inch thinning** | | | | | | | | | | | | |
| | June 16, Tree No. 30 | | | | | | July 18, Tree No. 4 | | | | | |
| 4 | 1.5 | 23 | 0.2 | 3 | 1.7 | 26 | 0.7 | 14 | 0.5 | 10 | 1.2 | 24 |
| 5 | 4.0 | 60 | 1.9 | 29 | 5.9 | 89 | 5.8 | 108 | 2.6 | 49 | 8.4 | 157 |
| 6 | 18.3 | 274 | 18.3 | 274 | 36.6 | 548 | 19.4 | 361 | 17.8 | 333 | 37.2 | 694 |
| 7- 8 | 3.5 | 53 | 18.7 | 280 | 22.2 | 333 | 6.6 | 122 | 14.8 | 277 | 21.4 | 399 |
| 9-10 | 0.5 | 8 | 10.9 | 163 | 11.4 | 173 | 1.5 | 27 | 13.0 | 241 | 14.5 | 268 |
| 11-12 | 0.2 | 2 | 7.2 | 108 | 7.4 | 110 | 0.5 | 10 | 6.9 | 129 | 7.4 | 139 |
| 13-14 | 0.1 | 1 | 5.4 | 81 | 5.5 | 82 | 0.2 | 4 | 4.7 | 87 | 4.9 | 91 |
| 15-16 | ..... | ..... | 3.2 | 47 | 3.2 | 47 | ..... | ..... | 1.6 | 29 | 1.6 | 29 |
| 17-18 | ..... | ..... | 2.5 | 37 | 2.5 | 37 | ..... | ..... | 0.9 | 16 | 0.9 | 16 |
| 19-20 | ..... | ..... | 1.4 | 21 | 1.4 | 21 | ..... | ..... | 0.7 | 12 | 0.7 | 12 |
| 21-22 | ..... | ..... | 1.1 | 17 | 1.1 | 17 | ..... | ..... | 0.6 | 11 | 0.6 | 11 |
| 23-25 | ..... | ..... | 0.9 | 13 | 0.9 | 13 | ..... | ..... | 0.5 | 9 | 0.5 | 9 |
| 26-30 | ..... | ..... | 0.5 | 9 | 0.5 | 9 | ..... | ..... | 0.4 | 8 | 0.4 | 8 |
| 31-36 | ..... | ..... | 0.2 | 3 | 0.2 | 3 | ..... | ..... | 0.2 | 3 | 0.2 | 3 |
| | 28.0 | 421 | 72.0 | 1085 | 100 | 1506 | 35.0 | 646 | 65.0 | 1214 | 100 | 1860 |
| **8-inch thinning** | | | | | | | | | | | | |
| | June 17, Tree No. 21 | | | | | | July 22, Tree No. 27 | | | | | |
| 5 | 1.0 | 15 | 0.0 | 0 | 1.0 | 15 | 2.5 | 34 | 0.3 | 4 | 2.8 | 38 |
| 6 | 3.7 | 55 | 2.6 | 39 | 6.3 | 94 | 5.3 | 70 | 3.5 | 46 | 8.8 | 116 |
| 7 | 3.7 | 55 | 4.3 | 62 | 8.0 | 117 | 3.7 | 40 | 2.3 | 30 | 6.0 | 70 |
| 8 | 14.3 | 214 | 19.9 | 292 | 34.2 | 506 | 14.4 | 191 | 26.9 | 358 | 41.3 | 549 |
| 9-10 | 4.1 | 62 | 16.1 | 241 | 20.2 | 303 | 4.2 | 56 | 16.6 | 220 | 20.8 | 276 |
| 11-12 | 0.4 | 6 | 9.9 | 148 | 10.3 | 154 | 0.5 | 6 | 7.9 | 106 | 8.4 | 112 |
| 13-14 | 0.2 | 3 | 5.0 | 75 | 5.2 | 78 | ..... | ..... | 4.1 | 55 | 4.1 | 55 |
| 15-16 | ..... | ..... | 3.8 | 57 | 3.8 | 57 | ..... | ..... | 1.5 | 20 | 1.5 | 20 |
| 17-18 | ..... | ..... | 3.1 | 46 | 3.1 | 46 | ..... | ..... | 0.9 | 13 | 0.9 | 13 |
| 19-20 | ..... | ..... | 2.3 | 35 | 2.3 | 35 | ..... | ..... | 1.2 | 16 | 1.2 | 16 |
| 21-22 | ..... | ..... | 2.4 | 36 | 2.4 | 36 | ..... | ..... | 1.3 | 18 | 1.3 | 18 |
| 23-25 | ..... | ..... | 2.4 | 38 | 2.4 | 38 | ..... | ..... | 1.7 | 22 | 1.7 | 22 |
| 26-30 | ..... | ..... | 1.0 | 15 | 1.0 | 15 | ..... | ..... | 0.9 | 13 | 0.9 | 13 |
| 31-36 | ..... | ..... | 0.2 | 3 | 0.2 | 3 | ..... | ..... | 0.6 | 8 | 0.6 | 8 |
| | 27.0 | 410 | 73.0 | 1087 | 100 | 1497 | 31.0 | 398 | 69.0 | 929 | 100 | 1327 |

*The percentages are based on the total number of measurements per tree.
†All percentage totals are expressed as the nearest whole number.

(a) The fruits were not uniformly spaced when thinned to a given guide distance. If thinning provided a perfectly uniform distribution of the fruits throughout the tree, thinning to 8-inch spacing would be twice as severe as thinning to 4-inch spacing. However, thinning to 8-inch spacing (as shown later) did not result in the removal of twice as many peaches from the tree as did 4-inch spacing. It would seem clear, although the popular conception has not always accepted it, that the distribution of the fruits on any peach tree is not uniform and that it is impossible, even with a heavy set of fruit, to space all the fruits exactly the same distance apart.

(b) Only approximately one-third of the measurements per tree between peaches had the desired spacing; for example, measurements between peaches in 4-, 6-, and 8-inch thinning showed percentages of 37.0, 36.6, and 34.2, respectively, for early thinning, and 31.6, 37.2, and 41.3, respectively, for late thinning, at the desired guide distance. (It was impossible in all cases to make measurements continuously from peach to peach throughout the tree. The measurements began at the end of a fruit-bearing branchlet and progressed to its base and then around the crotch to the nearest peach on an adjacent branchlet, provided this distance did not exceed an arbitrary 36 inches, and along this branchlet to the farthest peach. The process was then repeated on other branchlets. In a number of cases it was possible to include a measurement from a peach near the base of one of a pair of branchlets to a peach near the base of another pair.)

(c) A fairly high percentage (about 20 per cent) of the peaches on the tree was located so far apart (11-36 inches) that thinning to the different guide distances of 4, 6, or 8 inches did not affect the spacing between them.

(d) The average distance after thinning between the peaches on the six selected Elberta trees was as follows: 4-inch thinning, 6.9 inches for early thinning and 6.2 inches for late thinning; 6-inch thinning, 8.8 inches for early and 8.3 inches for late thinning; 8-inch thinning, 10.5 inches for early and 9.6 inches for late thinning. Thus, the average exceeded the guide distance in all cases.

(e) The greater the guide spacing, the lower was the percentage of fruits at the closest distances—for example, after 4-inch thinning there were some peaches which were 3 inches apart; whereas after 8-inch thinning no peaches remained closer than 5 inches.

(f) A higher percentage of the measurements occurred between the growing points along the wood between peaches on adjacent twigs than between those on the same twig.

The chief purpose in studying this phase of thinning has been to obtain a clearer understanding of the effect of the distances commonly used as guides in thinning. The information obtained is useful with respect to interpretation of some of the results which are presented later.

## EFFECT OF THINNING ON YIELD

### *EFFECT ON YIELD IN A YEAR (1931) WHEN THE SET OF FRUIT WAS HEAVY*

#### RESULTS WITH ELBERTA

The unthinned Elberta tree produced 8.9 bushels of fruit at harvest. When averages are considered, all thinning treatments reduced the yield per tree, Table 5. Invariably, more fruits were removed at early than at late thinning. Many of the fruits thinned off early would have been eliminated from the tree in the "June drop" or in other drops. However, the data seem to show that the early thinning caused the retention of a certain number of desirably located fruits which otherwise would have dropped. It is difficult to compare the effects of time of thinning on yield, because the trees vary in yield and yield is not so conducive to a percentage consideration as is size of fruit. It will be shown later that the thinning treatment on the heavily overloaded trees in 1931 had a decidedly beneficial influence on the yield the next year.

**TABLE 5.—Effect of Thinning on Yield of Elberta in a Year When the Set of Fruit was Heavy (1931)**
Trees planted 1926

| Tree No. | Time of thinning | Fruits removed | Yield | |
|---|---|---|---|---|
| | | No. | Bu. | No. of fruits |
| | Unthinned | | | |
| 23 | | | 8.9 | 2,943 |
| | 4-inch thinning | | | |
| 19 | Early—June 18 | 2,315 | 9.3 | 2,221 |
| 42 | Early—June 18 | 2,060 | 5.9 | 1,367 |
| | Average | 2,188 | 7.6 | 1,793 |
| 2 | Late—July 16 | 1,486 | 6.8 | 1,718 |
| | 6-inch thinning | | | |
| 3 | Early—June 12 | 5,640 | 8.8 | 1,934 |
| 7 | Early—June 12 | 4,730 | 6.3 | 1,311 |
| 28 | Early—June 16 | 2,615 | 6.0 | 1,126 |
| 30 | Early—June 16 | 1,926 | 5.7 | 1,260 |
| 34 | Early—June 16 | 3,350 | 6.1 | 1,150 |
| | Average | 3,652 | 6.5 | 1,356 |
| 4 | Late—July 18 | 1,725 | 6.7 | 1,730 |
| | 8-inch thinning | | | |
| 21 | Early—June 17 | 2,715 | 6.9 | 1,436 |
| 43 | Early—June 18 | 2,828 | 6.6 | 1,336 |
| | Average | 2,722 | 6.8 | 1,386 |
| 27 | Late—July 27 | 1,710 | 5.3 | 1,289 |

### RESULTS WITH TEN OTHER VARIETIES

Since only two trees were available of each variety and it was desired to use one tree for early thinning and one tree for late thinning, a check or unthinned tree was not left for each variety because of the possibility of serious limb breakage with no thinning. However, although it is impossible to determine directly the effect of thinning on yield in the 10 varieties, a comparison of yield on the early- and late-thinned trees indicates certain facts.

Invariably, as shown for Kirchner, Brackett, and Bronson (Table 6), when the early thinning was done very early (June 8, 9, and 10), it resulted in an appreciably higher yield than did the late thinning, Table 6. It will be noted also that the greatest difference between the number of fruits removed at the early and late thinnings occurred with these three varieties.

**TABLE 6.—Comparison of 6-inch, Early and Late Thinning on Yield of 10 Peach Varieties in a Year When the Set of Fruit was Heavy (1931)**

Trees planted 1923

| Variety | Tree No. | Time of thinning | No. of fruits removed | Yield | |
|---|---|---|---|---|---|
| | | | | Bu. | No. of fruits |
| J. H. Hale | 27 | Early—June 25 | 2,285 | 6.5 | 1,458 |
| | 28 | Late—July 24 | 1,925 | 6.6 | 2,122 |
| Kirchner | 2 | Early—June 8 | 13,360 | 10.1 | 4,277 |
| | 3 | Late—July 21 | 2,825 | 6.1 | 2,094 |
| Salberta | 16 | Early—June 20 | 3,750 | 8.4 | 2,549 |
| | 18 | Late—July 24 | 2,960 | 10.3 | 2,834 |
| Brackett | 8 | Early—June 10 | 9,719 | 9.5 | 2,646 |
| | 7 | Late—July 22 | 1,645 | 6.6 | 1,705 |
| Early Elberta | 14 | Early—June 20 | 3,600 | 8.6 | 2,460 |
| | 15 | Late—July 23 | 1,815 | 7.2 | 2,435 |
| New Prolific | 35 | Early—June 25 | 2,945 | 7.1 | 2,521 |
| | 36 | Late—July 27 | 3,078 | 4.8 | 2,282 |
| Banner | 29 | Early—June 25 | 3,270 | 6.5 | 3,038 |
| | 30 | Late—July 25 | 3,335 | 7.7 | 3,181 |
| Smock | 31 | Early—June 25 | 4,170 | 6.5 | 2,472 |
| | 32 | Late—July 27 | 2,980 | 6.1 | 2,423 |
| Fitzgerald | 25 | Early—June 24 | 5,280 | 8.4 | 3,767 |
| | 26 | Late—July 24 | 3,885 | 6.8 | 3,261 |
| Bronson | 4 | Early—June 9 | 9,428 | 8.5 | 4,264 |
| | 5 | Late—July 22 | 3,143 | 6.2 | 2,764 |

The yield resulting from early and late thinning in 1931 varied among the varieties, the differences probably being due as much to the fact that the yield from any two trees is seldom identical as to the effect of time of thinning. It would seem likely, because of the comparatively high number of fruits removed, that thinning decreased the yield of these 10 varieties in 1931. It will be shown later, however, that the yield the next year (1932) was increased considerably and consistently on these trees, due chiefly to the effects of early thinning.

## *EFFECT ON YIELD IN A YEAR (1932) FOLLOWING CORRESPONDING DIFFERENTIAL TREATMENT THE YEAR PREVIOUS*

### RESULTS WITH ELBERTA

The Elberta trees thinned early in 1931 and again in 1932 produced approximately twice as much fruit in 1932 as those thinned late and four times as much fruit in 1932 as the tree left unthinned. The average yields were: Early-thinned trees, 3.7, 4.1, and 4.3 bushels; late-thinned trees, 0.8, 1.8, and 1.9 bushels; unthinned tree, 0.8 bushel. The striking increase in yield in 1932 resulted largely from the influence of the 1931 treatment.

As the spacing increased from 4 to 6 to 8 inches in 1932, the yield increased from 3.7 to 4.1 to 4.3 bushels in the case of early thinning and from 0.8 to 1.8 to 1.9 bushels in the case of late thinning. Thus, there was a slight trend in 1932, on both the early- and the late-thinned trees, for the yield to increase as the spacing increased.

**TABLE 7.—Effect of Thinning on Yield of Elberta in 1932. Following Corresponding Differential Treatment the Year Previous**

Trees planted 1926

| Tree No. | Time of thinning | Fruits removed | Yield | |
|---|---|---|---|---|
| | | No. | Bu. | No. of fruits |
| **Unthinned** | | | | |
| 23 | | | 0.8 | 72 |
| **4-inch thinning** | | | | |
| 19 | Early—May 31 | 123 | 2.5 | 309 |
| 42 | Early—June 2 | 330 | 5.0 | 796 |
| • | Average | 226 | 3.7 | 552 |
| 2 | Late—July 19 | 17 | 0.8 | 92 |
| **6-inch thinning** | | | | |
| 3 | Early—May 31 | 215 | 2.7 | 301 |
| 7 | Early—May 31 | 182 | 2.3 | 237 |
| 28 | Early—May 31 | 480 | 5.0 | 610 |
| 30 | Early—June 1 | 377 | 4.0 | 472 |
| 34 | Early—June 1 | 805 | 6.5 | 781 |
| | Average | 411 | 4.1 | 480 |
| 4 | Late—July 19 | 61 | 1.8 | 199 |
| **8-inch thinning** | | | | |
| 21 | Early—June 2 | 330 | 3.6 | 349 |
| 21 | Early—June 2 | 870 | 5.0 | 658 |
| | Average | 600 | 4.3 | 503 |
| 27 | Late—July 19 | 73 | 1.9 | 241 |

### RESULTS WITH SEVEN OTHER VARIETIES

It will be noted that with the first six varieties listed in Table 8 the tree of each variety thinned early in 1932 (and similarly in 1931) outyielded the corresponding late-thinned tree. In all of these six varieties, the difference in favor of early thinning in relation to yield is striking and consistent.

For reasons explained previously no unthinned trees were left in the Variety Orchard. Due to the need for space to replant new varieties and because of inferior fruit characteristics, the two trees each of Kirchner and Bronson, which were used in the work the previous year, were removed. One tree of Brackett was also removed; hence, this variety was dropped from the experiments. J. H. Hale was not thinned in 1932 because the fruit was very scattered throughout the trees. The light crop on J. H. Hale in 1932 is perhaps an indication of tree exhaustion due to the production of about 6½ bushels (even though thinned to 6-inch spacing) in 1931. J. H. Hale (Tree 27) thinned early in 1931 produced 89 peaches in 1932, which, because of their enormous size, amounted to 1.3 bushels; the late-thinned tree (Tree 28) produced 63 peaches, or 1.0 bushel. All of the J. H. Hale peaches in 1932 had split pits. The behavior of J. H. Hale in 1932 seems to indicate that this variety responds more unfavorably to a heavy crop than any of the other varieties in the experiments. It may be of some interest to note here that the lighter crop on J. H. Hale in 1932 is probably associated with the fact that it bore some fruit in 1933, a year when Elberta was a failure.

As stated in the footnote of Table 8, records are not available on thinning differences on Carman in 1931. The yield data favor the late thinning in 1932. The discrepancy in the comparative yields in 1932, resulting from early and late thinning, between Carman and the other varieties is difficult to explain.

**TABLE 8.—Comparison of 6-inch, Early and Late Thinning on Yield of Seven Peach Varieties in 1932. Following Corresponding Differential Treatment the Year Previous**

Trees planted 1923 (except Carman, planted 1926)

| Variety | Tree No. | Time of thinning | No. of fruits removed | Yield | |
|---|---|---|---|---|---|
| | | | | Bu. | No. of fruits |
| Salberta | 16 | Early—June 3 | 850 | 5.0 | 856 |
| | 18 | Late—July 12 | 140 | 3.0 | 314 |
| Early Elberta | 14 | Early—June 3 | 1,485 | 6.8 | 1,299 |
| | 15 | Late—July 12 | 270 | 3.3 | 685 |
| New Prolific | 35 | Early—June 4 | 1,597 | 5.3 | 1,194 |
| | 35 | Late—July 12 | 590 | 3.8 | 656 |
| Banner | 29 | Early—June 3 | 1,115 | 4.3 | 853 |
| | 30 | Late—July 12 | 495 | 3.8 | 473 |
| Smock | 31 | Early—June 4 | 2,165 | 5.3 | 1,344 |
| | 32 | Late—July 12 | 885 | 3.0 | 945 |
| Fitzgerald | 25 | Early—June 3 | 165 | 2.3 | 383 |
| | 26 | Late—July 12 | 26 | 0.6 | 116 |
| Carman* | 96 | Early—June 4 | 920 | 5.8 | 918 |
| | 98 | Late—July 12 | 1,280 | 7.5 | 1,678 |

*Carman was not included in the thinning work in 1931. Both trees were thinned to 6-inch spacing, probably on the same day. The yield of the Carman trees was not kept separately in 1931; three trees produced a total of 22.5 bushels.

Carman Tree 98 is larger than Tree 96, which may partly account for the yields secured. In the light of these facts, the results with Carman in 1933 are especially striking.

### *EFFECT ON YIELD OF CARMAN IN A YEAR (1933) WHEN ONLY THE HARDIEST VARIETIES BORE A CROP*

In 1933 the Elberta crop at Wooster was a failure, due to winterkilling of the buds, but the hardiest varieties, including Carman, produced a crop.

It will be recalled that in 1932, the late-thinned Carman tree (Tree 98) outyielded the early-thinned tree (Tree 96) and that this case was exceptional as compared with Elberta and six other varieties. In 1933, however, the Carman tree thinned early in both 1932 and 1933 outyielded the tree thinned late by 709 peaches, or 4.8 bushels. Thus, in 1933 with the hardy Carman variety, increased yield resulted from early thinning following the early thinning of the year before. This is in agreement with the results for 1931-1932 obtained with other varieties.

**TABLE 9.—Comparison of 6-inch, Early and Late Thinning on Yield of Carman in a Year When Only the Hardiest Varieties Bore a Crop (1931)**

| Tree No. | Time of thinning | Yield | |
|---|---|---|---|
| | | Bu. | No. of fruits |
| 96 | Early | 6.8 | 911 |
| 98 | Late | 2.0 | 202 |

## EFFECT OF THINNING ON SIZE OF FRUIT

### *EFFECT ON SIZE OF FRUIT IN A YEAR (1931) WHEN THE SET WAS HEAVY*

#### RESULTS WITH ELBERTA

The data for 1931 at Wooster indicate that on trees with a heavy crop increased size of Elberta fruit was affected more by the time of thinning than by differences in the spacing or by the percentage of peaches removed per tree.

**Relation of the time of thinning and the spacing.**—Early thinning was more effective than late thinning in promoting increased size of fruit, Table 10.

Elberta thinned early to 4, 6, and 8 inches produced (considering averages) 8.5, 21.3, and 27.5 per cent, respectively, of fruit 2¼ inches or more[1] in diameter. Corresponding percentages for late thinning were lower—namely, 0.2, 1.6, and 0.3 per cent, respectively. The unthinned tree produced only 0.2 per cent of the largest-sized fruit.

The fact is noteworthy that, although the percentage of fruit 2¼ inches or more increased as the guide spacing increased from 4 to 6 to 8 inches at early thinning, a similar increase did not accompany the late thinning. Thus, a positive correlation, under the conditions of the experiment, between increased spacing and increased size depended on early thinning and indicated,

[1]The percentage of fruit 2¼ inches and more was not as high as in years of a lighter crop; in 1932, fruits 2¾ inches or more were designated as the largest size.

in turn, that the time of thinning was more important than the spacing in its effect on the percentage and amount of largest fruits. The relation which occurred for the 2¼-inch or larger size and various spacings also appeared, but somewhat less markedly so, in the next largest size—namely, the 2¼-2 inch fruits.

**TABLE 10.—Effect of Thinning on Size of Elberta in a Year (1931) When the Set of Fruit was Heavy**

Trees planted 1926

| Tree No. | Time of thinning | Fruits harvested | Size | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2¼ inches and over | | 2¼-2 inches | | 2-1¾ inches | | 1¾ inches and under | |
| | | No. | Pct. | No. | Pct. | No. | Pct. | No. | Pct. | No. |
| **Unthinned** | | | | | | | | | | |
| 23 | ..... | 2,943 | 0.2 | 6 | 4.6 | 133 | 46.6 | 1,365 | 49.6 | 1,439 |
| **4-inch thinning** | | | | | | | | | | |
| 19 | Early—June 18 | 2,221 | 3.3 | 72 | 48.4 | 1,075 | 47.1 | 1,046 | 1.3 | 28 |
| 42 | Early—June 18 | 1,367 | 13.7 | 187 | 53.2 | 727 | 32.3 | 441 | 0.9 | 12 |
| | Average | 1,764 | 8.5 | 129 | 50.8 | 901 | 39.7 | 743 | 1.1 | 20 |
| 2 | Late—July 16 | 1,718 | 0.2 | 4 | 16.4 | 282 | 69.9 | 1,201 | 13.4 | 231 |
| **6-inch thinning** | | | | | | | | | | |
| 3 | Early—June 12 | 1,934 | 10.9 | 209 | 59.9 | 1,167 | 27.2 | 524 | 1.9 | 34 |
| 7 | Early—June 12 | 1,311 | 9.3 | 122 | 67.1 | 879 | 22.2 | 291 | 1.5 | 19 |
| 28 | Early—June 16 | 1,126 | 40.8 | 458 | 52.9 | 594 | 6.1 | 69 | 0.1 | 5 |
| 30 | Early—June 16 | 1,260 | 12.8 | 163 | 52.1 | 656 | 32.5 | 409 | 2.6 | 32 |
| 34 | Early—June 16 | 1,150 | 32.9 | 378 | 57.6 | 662 | 9.5 | 104 | 0.6 | 6 |
| | Average | 1,356 | 21.3 | 266 | 57.9 | 792 | 19.5 | 279 | 1.3 | 19 |
| 4 | Late—July 18 | 1,730 | 1.6 | 29 | 42.4 | 733 | 54.9 | 949 | 2.3 | 39 |
| **8-inch thinning** | | | | | | | | | | |
| 21 | Early—June 17 | 1,436 | 20.1 | 288 | 60.5 | 869 | 18.8 | 269 | 0.8 | 10 |
| 43 | Early—June 18 | 1,336 | 34.9 | 466 | 54.1 | 723 | 10.4 | 139 | 0.6 | 8 |
| | Average | 1,386 | 27.5 | 377 | 57.2 | 796 | 14.6 | 204 | 0.7 | 9 |
| 27 | Late—July 27 | 1,289 | 0.3 | 4 | 33.9 | 438 | 59.6 | 768 | 6.1 | 79 |

The unthinned tree produced 96.2 per cent of its fruit of a size 2 inches and under (49.6 per cent sizing as 1¾ inches or less and 46.6 per cent as 2-1¾ inches). For late thinning, the percentages at the smallest sizes for 4-, 6-, and 8-inch thinning were, respectively: 1¾ inch and less—13.4, 2.3, and 6.1; 2-1¾ inches—69.9, 54.9, and 59.9; total, 2 inches and under—23.3, 57.2, and 66.6. For early thinning, the corresponding percentages were, respectively: 1¾ inches and less—1.1, 1.3, and 0.7; 2-1¾ inches—39.7, 19.5, and 14.6; total, 2 inches and under—40.8, 20.8, and 15.3. Obviously, both late and early thinning decreased the proportion of small peaches below that from the unthinned tree.

**Relation of time of thinning and percentage of fruits removed.**—The evidence indicates, Table 11, that with a heavy set of fruit the time of thinning is of greater importance in its effect on size of fruit than is the percentage of peaches removed per tree—for example, Tree No. 19 was thinned early to 4-inch spacing and 47.2 per cent of the peaches on the tree was removed; Tree No. 27 was thinned late to 8-inch spacing and 56.3 per cent, or a higher percentage, of the fruits was removed. Since 9.1 per cent more peaches were removed and the original number of peaches was less on Tree No. 27 than on Tree No. 19, it could reasonably be expected that the percentage of largest-sized peaches would be highest on the tree with the fewest peaches. It will be noted also that from Tree No. 19 (47.2 per cent removed) 9.3 bushels, or 4 bushels more, were picked than from Tree No. 27 (56.3 per cent removed). Everything seemed to favor the highest percentage of largest-sized fruits being produced on Tree No. 27; in spite of this, it produced only 0.3 per cent of 2¼-inch or larger fruit in contrast to 3.3 per cent for Tree No. 19. This trend is accen-

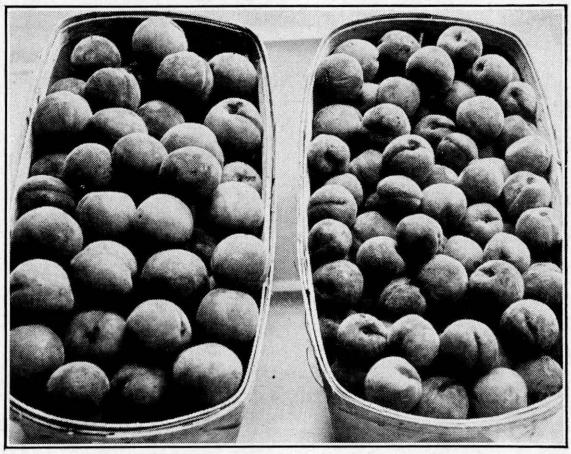

**Fig. 2.—Baskets of peaches from thinned and unthinned trees**

**TABLE 11.—Relation of Percentage of Peaches Removed in Thinning to Size**

Elberta, 1931. Trees planted 1926

| | 4-inch thinning | | 6-inch thinning | | 8-inch thinning | |
|---|---|---|---|---|---|---|
| | June 18 | July 16 | June 16 | July 18 | June 17 | July 22 |
| | Tree 19 | Tree 2 | Tree 30 | Tree 4 | Tree 21 | Tree 27 |
| | *Thinned early* | *Thinned late* | *Thinned early* | *Thinned late* | *Thinned early* | *Thinned late* |
| Per cent of peaches removed | 47.2 | 44.9 | 56.1 | 48.1 | 64.5 | 56.3 |
| Total number of peaches on tree | 4,905 | 3,326 | 3,432 | 3,585 | 4,212 | 3,037 |
| Number of peaches removed | 2,315 | 1,486 | 1,926 | 1,725 | 2,715 | 1,710 |
| Time of thinning per man, hours | 2.0 | 0.75 | 1.5 | 1.0 | 2.0 | 1.0 |
| Number of peaches left on tree | 2,590 | 1,840 | 1,506 | 1,860 | 1,497 | 1,327 |
| Yield: | | | | | | |
| Number of peaches harvested | 2,221 | 1,718 | 1,260 | 1,730 | 1,436 | 1,287 |
| Bushels harvested | 9.3 | 6.8 | 5.7 | 6.7 | 6.9 | 5.3 |
| Size of fruit (per cent): | | | | | | |
| 2¼ inches and over | 3.3 | 0.2 | 12.8 | 1.6 | 20.1 | 0.3 |
| 2¼–2 inches | 48.4 | 16.4 | 52.1 | 42.4 | 60.5 | 33.9 |
| 2–1¾ inches | 47.1 | 69.9 | 32.5 | 54.9 | 18.8 | 59.6 |
| 1¾ inches and under | 1.3 | 13.4 | 2.6 | 2.3 | 0.8 | 6.1 |
| Number of drops after thinning | 369 | 122 | 246 | 130 | 61 | 40 |

tuated when the 2¼-2 inch size is included (compare 33.9 per cent for Tree No. 27 with the 48.4 per cent for Tree No. 19). There seems to be just one explanation and that a simple one for the highest percentage of largest-sized fruits where a lower percentage of developing fruits was removed in thinning—namely, early thinning promoted increased size much more than did late thinning. When thinning was practiced early, the results, even on different trees, are in accordance with a logical expectation; that is, when the percentage of fruits removed increased from 47.2 to 56.1 to 64.5, the percentage of largest-sized fruits increased from 3.3 to 12.8 to 20.1. When thinning was practiced late, however, no such relationship occurred.

### RESULTS WITH TEN OTHER VARIETIES

Size of fruit is in part a varietal characteristic, a factor which accounts to some extent for the variation in results which have been obtained among the different varieties.

It is self-evident, Table 12, that some varieties did not produce any of the largest-sized fruits (2¼ inch or more), irrespective of whether the thinning was done early or late on the heavily overloaded trees. The spacing was uniform for all varieties (6-inch thinning). It may be claimed, and with reason, that 6-inch thinning was not sufficient. Perhaps the spacing should rightfully have exceeded any that was made, or the pruning should have been more severe than was practiced. However, it will be noted that the least number of peaches removed was 1,645 per tree; in one case, 13,360 peaches were removed per tree.

**TABLE 12.—Comparison of 6-inch, Early and Late Thinning on Size of 10 Peach Varieties in a Year (1931) When the Set of Fruit was Heavy**
Trees planted 1923

| Variety | Tree No. | Time of thinning | Fruits harvested | Size | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2¼ inches and over | | 2¼-2 inches | | 2-1¾ inches | | 1¾ inches and under | |
| | | | No. | Pct. | No. | Pct. | No. | Pct. | No. | Pct. | No. |
| J. H. Hale | 27 | Early—June 25 | 1,458 | 10.7 | 156 | 40.5 | 601 | 36.6 | 535 | 11.4 | 166 |
| | 28 | Late—July 24 | 2,122 | 2.9 | 62 | 30.0 | 635 | 52.2 | 1,108 | 14.5 | 317 |
| Kirchner | 2 | Early—June 8 | 4,277 | 0.1 | 1 | 2.1 | 88 | 19.1 | 816 | 78.8 | 3,372 |
| | 3 | Late—July 21 | 2,094 | 0.2 | 4 | 6.3 | 134 | 37.1 | 778 | 56.4 | 1,178 |
| Salberta | 16 | Early—June 20 | 2,549 | 0.1 | 3 | 11.2 | 286 | 55.0 | 1,402 | 33.7 | 858 |
| | 18 | Late—July 24 | 2,834 | 0.1 | 1 | 8.7 | 244 | 61.9 | 1,757 | 29.3 | 833 |
| Brackett | 8 | Early—June 10 | 2,646 | 0.9 | 23 | 28.0 | 741 | 61.7 | 1,633 | 9.5 | 249 |
| | 7 | Late—July 22 | 1,705 | 0.1 | 2 | 12.6 | 215 | 67.8 | 1,159 | 19.3 | 329 |
| Early Elberta | 14 | Early—June 20 | 2,460 | 0.3 | 6 | 23.2 | 570 | 68.4 | 1,682 | 8.2 | 202 |
| | 15 | Late—July 23 | 2,435 | ..... | ..... | 3.7 | 90 | 66.1 | 1,609 | 30.2 | 736 |
| New Prolific | 35 | Early—June 25 | 2,521 | ..... | ..... | 4.1 | 103 | 51.4 | 1,296 | 44.5 | 1,122 |
| | 36 | Late—July 27 | 2,282 | ..... | ..... | 2.2 | 57 | 44.3 | 1,011 | 53.5 | 1,214 |
| Banner | 29 | Early—June 25 | 3,038 | ..... | ..... | 2.7 | 82 | 36.3 | 1,103 | 61.0 | 1,853 |
| | 30 | Late—July 25 | 3,181 | ..... | ..... | 1.9 | 60 | 30.7 | 978 | 67.4 | 2,143 |
| Smock | 31 | Early—June 25 | 2,472 | ..... | ..... | 2.4 | 59 | 37.7 | 932 | 59.9 | 1,481 |
| | 32 | Late—July 27 | 2,423 | ..... | ..... | 0.9 | 23 | 25.5 | 619 | 73.6 | 1,781 |
| Fitzgerald | 25 | Early—June 24 | 3,767 | ..... | ..... | 2.2 | 85 | 24.9 | 934 | 72.8 | 2,396 |
| | 26 | Late—July 24 | 3,261 | ..... | ..... | 1.9 | 62 | 24.6 | 803 | 73.5 | 2,396 |
| Bronson | 4 | Early—June 9 | 4,264 | ..... | ..... | 0.9 | 38 | 26.7 | 1,148 | 72.4 | 3,078 |
| | 5 | Late—July 22 | 2,764 | ..... | ..... | 0.4 | 9 | 23.2 | 641 | 76.4 | 2,114 |

A number of the varieties were of such poor size that their suitability for commercial planting is questionable. However, even though the percentage of large fruit is not high or the differences between the treatments always marked, nevertheless the highest percentage of the two largest sizes occurred in nine of the 10 varieties when thinning was done early.

## *EFFECT ON SIZE OF FRUIT IN A YEAR (1932) FOLLOWING CORRESPONDING DIFFERENTIAL TREATMENT THE YEAR PREVIOUS*

### RESULTS WITH ELBERTA

The results obtained in 1932 were significantly affected by the thinning treatment of 1931. Without the information gained in 1931 and considering only the 1932 crop, the conclusion, an improper one, might be made that late thinning is more effective than early thinning in increasing the size of fruit.

**TABLE 13.—Effect of Thinning on Size of Elberta in a Year (1932) Following Corresponding Differential Treatment the Year Previous**

Trees planted 1926

| Tree No. | Time of thinning | Fruits harvested No. | Size | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2¾ inches and over | | 2¾–2¼ inches | | 2¼–2 inches | | 2 inches and under | |
| | | | Pct. | No. | Pct. | No. | Pct. | No. | Pct. | No. |
| **Unthinned** | | | | | | | | | | |
| 23 | ..... | 72 | 69.4 | 50 | 25.0 | 18 | 5.5 | 4 | ..... | ..... |
| **4-inch thinning** | | | | | | | | | | |
| 19 | Early—May 31 | 309 | 46.6 | 144 | 45.6 | 141 | 6.1 | 19 | 1.6 | 5 |
| 42 | Early—June 2 | 796 | 3.2 | 26 | 58.1 | 463 | 31.3 | 249 | 7.3 | 58 |
| | Average | 552 | 24.9 | 85 | 51.8 | 302 | 18.7 | 134 | 4.4 | 31 |
| 2 | Late—July 19 | 92 | 52.1 | 48 | 35.9 | 33 | 10.9 | 10 | 1.1 | 1 |
| **6-inch thinning** | | | | | | | | | | |
| 3 | Early—May 31 | 301 | 32.8 | 99 | 54.4 | 164 | 11.2 | 34 | 1.3 | 4 |
| 7 | Early—May 31 | 237 | 61.2 | 145 | 30.8 | 73 | 5.9 | 14 | 2.1 | 5 |
| 28 | Early—May 31 | 610 | 11.9 | 73 | 76.5 | 467 | 10.5 | 64 | 1.0 | 2 |
| 30 | Early—June 1 | 472 | 23.9 | 113 | 68.2 | 322 | 7.4 | 35 | 0.4 | 6 |
| 34 | Early—June 1 | 781 | 17.5 | 137 | 59.8 | 467 | 17.6 | 138 | 5.0 | 39 |
| | Average | 480 | 29.4 | 113 | 57.9 | 298 | 10.5 | 57 | 1.9 | 11 |
| 4 | Late—July 19 | 199 | 56.7 | 113 | 34.1 | 68 | 6.5 | 13 | 2.5 | 5 |
| **8-inch thinning** | | | | | | | | | | |
| 21 | Early—June 2 | 349 | 48.1 | 168 | 43.8 | 153 | 6.3 | 22 | 1.7 | 6 |
| 43 | Early—June 2 | 658 | 16.6 | 109 | 58.2 | 383 | 18.8 | 124 | 6.4 | 42 |
| | Average | 503 | 32.3 | 138 | 51.0 | 268 | 12.5 | 73 | 4.0 | 24 |
| 27 | Late—July 19 | 241 | 49.4 | 119 | 42.3 | 102 | 7.5 | 18 | 0.8 | 2 |

Early thinning in 1932, on the same trees used in 1931, did not result in an increase in size of fruit over late thinning, when calculated on a percentage basis. In fact, on a percentage basis, late thinning apparently promoted larger size than did early thinning. The highest percentage of largest-sized fruit (2¾ inches or larger) occurred in 1932 on the tree left unthinned in 1931 and 1932. The figures are as follows for the 2¾-inch size of fruit, Table 13: Early thinning—24.9, 29.4, and 32.3 per cent for the 4-, 6-, and 8-inch spacings, respectively; late thinning—52.1, 56.7, and 49.4 per cent for the three spacings; and no thinning—69.4 per cent.

Although the unthinned tree produced the highest percentage of the largest-sized fruit, it did not produce the most bushels of such fruit. This is because the yield per early-thinned tree was considerably greater than that of the late-thinned or unthinned tree.

### RESULTS WITH SEVEN OTHER VARIETIES

With most of the seven varieties in 1932, early thinning did not, in contrast to the results in 1931, result in the highest percentage of fruit in the largest sizes when calculated on a percentage basis. Although early thinning resulted in a lower percentage of largest-sized fruit, it resulted in most cases in more fruits of the largest sizes, Table 14. As with Elberta, the higher yield associated with the early thinning resulted in 1932 in a greater amount of largest-sized fruit. This indicates, besides the effect of early thinning, that size is partly dependent on the size of crop per tree and, for the most part, that the lighter the crop, the larger the size of fruit; it also involves effects of the previous condition of the trees. The differences in percentages for different varieties are, in part, symptoms of varietal characteristics.

**TABLE 14.—Comparison of 6-inch, Early and Late Thinning on Size of Seven Other Peach Varieties in a Year (1932) Following Corresponding Differential Treatment the Year Previous**

Trees planted 1923

| Variety | Tree No. | Time of thinning | Fruits harvested | Size | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2¼ inches and over | | 2¼–2 inches | | 2–1¾ inches | | 1¾ inches and under | |
| | | | No. | Pct. | No. | Pct. | No. | Pct. | No. | Pct. | No. |
| Salberta | 16 | Early—June 3 | 856 | 39.2 | 336 | 52.7 | 451 | 7.5 | 64 | 0.6 | 5 |
| | 18 | Late—July 12 | 314 | 95.2 | 299 | 4.1 | 13 | 0.7 | 2 | 0.0 | 0 |
| Early Elberta | 14 | Early—June 3 | 1,299 | 38.5 | 500 | 42.9 | 558 | 13.4 | 174 | 5.2 | 67 |
| | 15 | Late—July 12 | 685 | 38.1 | 261 | 48.0 | 329 | 10.9 | 75 | 3.0 | 20 |
| New Prolific | 35 | Early—June 4 | 1,194 | 8.6 | 103 | 54.0 | 645 | 29.7 | 355 | 7.7 | 91 |
| | 36 | Late—July 12 | 656 | 54.3 | 356 | 34.1 | 224 | 8.8 | 58 | 2.8 | 18 |
| Banner | 29 | Early—June 3 | 853 | 49.6 | 423 | 37.6 | 321 | 9.5 | 81 | 3.3 | 28 |
| | 30 | Late—July 12 | 473 | 56.8 | 269 | 29.4 | 139 | 10.8 | 51 | 3.0 | 14 |
| Smock | 31 | Early—June 4 | 1,344 | 15.8 | 212 | 60.2 | 809 | 20.3 | 273 | 3.7 | 50 |
| | 32 | Late—July 12 | 945 | 10.0 | 94 | 49.5 | 468 | 33.4 | 316 | 7.1 | 67 |
| Fitzgerald | 25 | Early—June 3 | 383 | 59.6 | 228 | 31.7 | 121 | 7.8 | 30 | 0.9 | 4 |
| | 26 | Late—July 12 | 116 | 61.1 | 71 | 25.9 | 30 | 12.8 | 15 | 0.2 | 2 |
| Carman | 96 | Early—June 4 | 918 | 65.5 | 601 | 31.1 | 286 | 3.4 | 31 | 0.0 | 0 |
| | 98 | Late—July 12 | 1,678 | 29.8 | 501 | 54.5 | 915 | 13.1 | 220 | 2.6 | 42 |

## *EFFECT ON SIZE OF CARMAN FRUIT IN A YEAR (1933) WHEN ONLY THE HARDIEST VARIETIES BORE A CROP*

In 1933, Carman produced a lower percentage but a greater amount of largest-sized fruit (2¼ inches or more) on the early-thinned than on the late-thinned trees, Table 15. This is in accordance with the results with the other varieties the previous year.

**TABLE 15.—Comparison of 6-inch, Early and Late Thinning on Size of Carman in a Year When Only the Hardiest Varieties Bore a Crop (1933)**

| Tree No. | Time of thinning | Total peaches | Size of fruit | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2¼ inches and over | | 2¼–2 inches | | 2–1¾ inches | |
| | | No. | Pct. | No. | Pct. | No. | Pct. | No. |
| 96 | Early | 911 | 90.1 | 821 | 9.7 | 88 | 0.2 | 2 |
| 98 | Late | 202 | 98.0 | 198 | 0.2 | 4 | 0.0 | 0 |

## *SIZE OF PEACHES ACCORDING TO NUMBER PER BUSHEL*

There is a relationship between yield per tree and size of fruit—the higher the yield, the more peaches required per bushel. However, the effects of thinning, early thinning in particular, have been sufficient in a number of cases in these experiments to promote a situation where the smallest number of peaches per bushel (and thus larger size) accompanied the higher yields per tree.

### RESULTS WITH ELBERTA

In 1931, when the set of fruit was heavy, the unthinned tree required the greatest number of fruits per bushel (331 peaches per bushel) and thus produced smaller fruits than those from the thinned tree; in this year the unthinned tree outyielded the thinned trees. In 1932, the yield of the unthinned tree was lower and the size of fruit larger, so that fewer, or only 90, peaches were required to fill a bushel basket; these fruits exceeded those from the thinned trees in size.

That the factor of time of thinning may change the normal relationship between yield per tree and size of fruit is evident from a comparison of the data for the early- and late-thinned trees, Table 16. In 1931, at 4-inch spacing, the tree thinned early yielded 7.6 bushels, of which 236 peaches were required to fill a bushel basket, in contrast to the lower yield (6.8 bushels) and larger number of peaches (252 per bushel) from the tree thinned late. Thus, in this instance, the early thinning promoted both a higher yield and larger size of fruit. When the data for 8-inch spacing are considered, the early thinning again produced a similar result. At 6-inch spacing, there is little difference in yield but the fruit on the early-thinned tree was larger than on the late-thinned. In 1932, only in the case of the 8-inch, or greatest spacing, did the early thinning, when compared with late thinning, result in the larger fruit (as indicated by fewer peaches per bushel) and, at the same time, in higher yield per tree.

**TABLE 16.—Size of Peaches According to Number per Bushel***

| Variety | Time of thinning | Spacing | 1931 | | 1932 | |
|---|---|---|---|---|---|---|
| | | | Peaches per bushel | Yield | Peaches per bushel | Yield |
| | | | *No.* | *Bu.* | *No.* | *Bu.* |
| Elberta | Unthinned | None | 331 | 8.9 | 90 | 0.8 |
| Elberta | Early | 4-inch | 236 | 7.6 | 149 | 3.7 |
| | Late | 4-inch | 252 | 6.8 | 115 | 0.8 |
| Elberta | Early | 6-inch | 209 | 6.5 | 117 | 4.1 |
| | Late | 6-inch | 257 | 6.7 | 111 | 1.8 |
| Elberta | Early | 8-inch | 204 | 6.8 | 115 | 4.3 |
| | Late | 8-inch | 243 | 5.3 | 127 | 1.9 |
| J. H. Hale | Early | 6-inch | 224 | 6.5 | 68 | 1.3 |
| | Late | 6-inch | 322 | 6.6 | 63 | 1.0 |
| Kirchner | Early | 6-inch | 427 | 10.1 | ..... | ..... |
| | Late | 6-inch | 340 | 6.1 | ..... | ..... |
| Salberta | Early | 6-inch | 302 | 8.4 | 170 | 5.0 |
| | Late | 6-inch | 275 | 10.3 | 105 | 3.0 |
| Brackett | Early | 6-inch | 278 | 9.5 | ..... | ..... |
| | Late | 6-inch | 258 | 6.6 | ..... | ..... |
| Early Elberta | Early | 6-inch | 286 | 8.6 | 191 | 6.8 |
| | Late | 6-inch | 338 | 7.2 | 208 | 3.3 |
| New Prolific | Early | 6-inch | 355 | 7.1 | 226 | 5.3 |
| | Late | 6-inch | 475 | 4.8 | 173 | 3.8 |
| Banner | Early | 6-inch | 466 | 6.5 | 198 | 4.3 |
| | Late | 6-inch | 413 | 7.7 | 125 | 3.8 |
| Smock | Early | 6-inch | 380 | 6.5 | 254 | 5.3 |
| | Late | 6-inch | 397 | 6.1 | 315 | 3.0 |
| Fitzgerald | Early | 6-inch | 448 | 8.4 | 171 | 2.3 |
| | Late | 6-inch | 479 | 6.8 | 193 | 0.6 |
| Bronson | Early | 6-inch | 502 | 8.5 | ..... | ..... |
| | Late | 6-inch | 446 | 6.2 | ..... | ..... |
| Carman | Early | 6-inch | ..... | ..... | 158 | 5.8 |
| | Late | 6-inch | ..... | ..... | 224 | 7.5 |

*Average number of peaches of Elberta per bushel was as follows: 1931—2¼ inches and over, 185; 2¼-2 inches, 215; 2-1¾ inches, 265; 1¾ inches and less, 400; 1932—2¾ inches and over, 95; 2¾-2¼ inches, 125; 2¼-2 inches, 195; 2 inches and under, 245.

### RESULTS WITH OTHER VARIETIES

As with Elberta, the number of peaches per bushel of the different varieties has been affected by two factors—namely, the yield per tree and the effect of the treatment (including the influence of the thinning in 1931 on the results in 1932). In general, the number of peaches per bushel indicates the comparative size of the fruit of the different varieties. The fact that size of fruit is in part a varietal characteristic is a feature which accounts to some extent for the variation in responses which have resulted among the different varieties. The number of peaches per bushel was not always greater after late thinning than after early thinning; although the factor of yield per tree is involved, it should also be recalled that the thinning did not greatly affect size of a number of varieties.

Early thinning, higher yield per tree, and larger size on the basis of number of peaches per bushel were associated in 1931 with the Brackett, Early Elberta, New Prolific, Smock, and Fitzgerald varieties and in 1932 with Early Elberta, Smock, and Fitzgerald.

## THINNING COSTS AND RECEIPTS

In this discussion on costs, some of the figures which have been used have been calculated, because with a limited quantity of fruit per tree it was impossible to keep a record of the sales of each size of fruit from each tree. Explanation of certain factors in the calculations is given in the footnotes of Tables 19 and 21.

### *TIME REQUIRED PER TREE*

#### RESULTS WITH ELBERTA

About twice as much time was required to thin early as late, Table 17. In 1931 when the set of fruit was heavy, 1.9, 2.4, and 2.1 hours were required per tree at early thinning to 4-, 6-, and 8-inch spacing, respectively; 0.75, 1.0, and 1.0 hours were required for late thinning at the three spacings. In 1932, the corresponding figures were 0.4, 0.7, and 0.8 hours for early thinning and 0.05, 0.2, and 0.3 hours, respectively, for late thinning. The chief reason for the reduction in time at the late thinning, in each year, is that less fruits were removed, due to the June drop. At the three spacings, in 1931, 2,188, 3,652, and 2,722 developing fruits were removed per tree at early thinning and 1,486, 1,725, and 1,710 fruits at late thinning; in 1932, the corresponding figures were 226, 411, and 600 fruits at early thinning and 17, 61, and 73 fruits at late thinning.

**TABLE 17.—Time Required to Thin Elberta**

| Tree No. | Time of thinning | 1931 | | 1932 | |
|---|---|---|---|---|---|
| | | Fruits removed | Time per tree | Fruits removed | Time per tree |
| | | No. | Hr. | No. | Hr. |
| **Unthinned** | | | | | |
| 23 | | | | | |
| **4-inch thinning** | | | | | |
| 19 | Early | 2,315 | 2 | 123 | 0.4 |
| 42 | Early | 2,060 | 1¾ | 330 | 0.4 |
| | Average. | 2,188 | 1.9 | 226 | 0.4 |
| 2 | Late | 1,486 | 0.75 | 17 | 0.05 |
| **6-inch thinning** | | | | | |
| 3 | Early | 5,640 | 3 | 215 | 0.7 |
| 7 | Early | 4,730 | 2¾ | 182 | 0.5 |
| 28 | Early | 2,615 | 2¼ | 480 | 0.8 |
| 30 | Early | 1,926 | 1½ | 377 | 0.7 |
| 34 | Early | 3,350 | 2½ | 805 | 1.0 |
| | Average. | 3,652 | 2.4 | 411 | 0.7 |
| 4 | Late | 1,725 | 1 | 61 | 0.2 |
| **8-inch thinning** | | | | | |
| 21 | Early | 2,715 | 2 | 330 | 0.4 |
| 43 | Early | 2,828 | 2¼ | 870 | 1.2 |
| | Average. | 2,722 | 2.1 | 600 | 0.8 |
| 27 | Late | 1,710 | 1 | 73 | 0.3 |

The rate of removing peaches (not the time per tree) was slower in 1932 than in 1931, due chiefly to a lighter set of fruit per tree and partly to the time consumed in moving about the tree whether many or few fruits were removed.

On a given date, thinning to 4-inch spacing was slightly faster than thinning to 8-inch spacing, because the latter required the removal of more fruits. Other than this, there was not much difference in time required for 4-, 6-, or 8-inch spacing, providing the work was done on trees of the same size and the dimensions of the fruit were the same. The time required on a given date varied with the workmen more than with the distance or spacing.

To a certain extent, the speed of the late thinning was accelerated (especially in 1931) by the increased size and natural spacing of the fruits; the workmen could thin, in part, by "feeling" with the hands without the necessity of looking carefully to see the fruits.

### RESULTS WITH ELEVEN OTHER VARIETIES

As with Elberta, about twice as much time was required per tree for early as for late thinning, Table 18. Variation from this relation depended, among other factors, on the actual date of early thinning and on differences in varietal fruit-setting habits and size of tree (as between the comparatively large and tall Smock and the smaller J. H. Hale of similar age).

**TABLE 18.—Time Required to Thin Varieties Other Than Elberta. 6-inch Spacing**

| Variety | Tree No. | Time of thinning | 1931 | | 1932 | |
|---|---|---|---|---|---|---|
| | | | Fruits removed | Time per tree | Fruits removed | Time per tree |
| | | | *No.* | *Hr.* | *No.* | *Hr.* |
| J. H. Hale | 27 | Early | 2,285 | 2 | ..... | ..... |
| | 28 | Late | 1,925 | 1½ | ..... | ..... |
| Kirchner | 2 | Early | 13,360 | 6 | ..... | ..... |
| | 3 | Late | 2,825 | 2 | ..... | ..... |
| Salberta | 16 | Early | 3,750 | 3 | 850 | 1½ |
| | 18 | Late | 2,960 | 1½ | 140 | ⅓ |
| Brackett | 8 | Early | 9,719 | 4 | ..... | ..... |
| | 7 | Late | 1,645 | 1¼ | ..... | ..... |
| Early Elberta | 14 | Early | 3,600 | 3 | 1,485 | 1¾ |
| | 15 | Late | 1,815 | 1¼ | 270 | ⅓ |
| New Prolific | 35 | Early | 2,945 | 3 | 1,597 | 1½ |
| | 36 | Late | 3,078 | 1¾ | 590 | ½ |
| Banner | 29 | Early | 3,270 | 2½ | 1,115 | 1½ |
| | 30 | Late | 3,335 | 2 | 495 | 5/6 |
| Smock | 31 | Early | 4,170 | 3½ | 2,165 | 2¾ |
| | 32 | Late | 2,980 | 2 | 885 | 1 |
| Fitzgerald | 25 | Early | 5,280 | 3½ | 165 | ½ |
| | 26 | Late | 3,885 | 2 | 26 | 4 minutes |
| Bronson | 4 | Early | 9,428 | 4½ | ..... | ..... |
| | 5 | Late | 3,143 | 1¾ | ..... | ..... |
| Carman | 96 | Early | ..... | ..... | 920 | 1 |
| | 98 | Late | ..... | ..... | 1,280 | 1⅓ |

Less time was required at early and late thinning, respectively, in 1932 than in 1931. This again was due to the difference in number of fruits removed and to the other reasons given for Elberta at a definite spacing. The factor of

"feeling", although minor to that of the June drop, in increasing the speed at late thinning is evident from a comparison of the results with New Prolific. In 1931, with New Prolific, 2,945 fruits were removed in 3 hours at early thinning (June 25); whereas 3,078, a slightly greater number, required only 1¾ hours at late thinning (July 27). A similar trend occurred with Banner.

## EXPENSES AND RECEIPTS PER TREE

### *EXPERIMENTS IN A YEAR WHEN THE SET WAS EXCEPTIONALLY HEAVY (1931)*

#### RESULTS WITH ELBERTA

Serious peach marketing problems occurred in 1931; nevertheless, profits were obtained with Elberta, Table 19, in a year unfavorable for market demand and price but favorable for yield. From an Elberta tree which was left unthinned and which yielded 8.9 bushels, only 2.3 bushels were sold, for a return of $1.30 at prevailing prices and demand. Smaller quantity and number of fruits were produced per thinned tree, but, because of the larger size, a greater quantity of fruit was sold and at comparatively higher prices. The early thinning about doubled the receipts per tree over no thinning (average of $2.47 as compared with $1.30). The average of the receipts per tree from late

**TABLE 19.—Receipts per Tree from Thinning in a Year When the Set of Fruit was Heavy (1931)**
Elberta, planted spring of 1926

| Time of thinning | Fruit sold* | | | | | | | | Thinning expense per tree§ | Net receipts per tree† |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2¼ inches and over | | 2¼–2 inches | | 2–1¾ inches | | Total | | | |
| | Bu.‡ | Dol. | Bu.‡ | Dol. | Bu.‡ | Dol. | Bu.‡ | Dol. | Dol. | Dol. |
| Unthinned | | | | | | | | | | |
| ..... | 0.03 | 0.02 | 0.6 | 0.30 | 1.7 | 0.98 | 2.3 | 1.30 | ..... | 1.30 |
| 4-inch thinning | | | | | | | | | | |
| Early..... | 0.7 | 0.42 | 4.2 | 2.10 | 0.9 | 0.36 | 5.8 | 2.88 | 0.48 | 2.48 |
| Late..... | 0.02 | 0.01 | 1.3 | 0.65 | 1.5 | 0.60 | 2.8 | 1.26 | 0.20 | 1.06 |
| 6-inch thinning | | | | | | | | | | |
| Early..... | 1.4 | 0.84 | 3.7 | 1.85 | 0.4 | 0.16 | 5.5 | 2.85 | 0.60 | 2.25 |
| Late..... | 0.1 | 0.06 | 3.4 | 1.70 | 1.2 | 0.48 | 4.7 | 2.24 | 0.25 | 1.99 |
| 8-inch thinning | | | | | | | | | | |
| Early..... | 2.0 | 1.20 | 3.8 | 1.90 | 0.3 | 0.12 | 6.1 | 3.22 | 0.53 | 2.69 |
| Late..... | 0.02 | 0.01 | 2.0 | 1.00 | 0.9 | 0.36 | 2.9 | 1.37 | 0.25 | 1.12 |

*Sales were made at 60¢ per bu. for 2¼ inches and over; 50¢ for 2-2¼ inches; and 40¢ for 1¾-2 inches. Only one-third the amount of 1¾-2 inch fruit was marketed; there was no demand for the other two-thirds of this size. It is assumed that fruit sold was proportionately divided by sizes for the different trees.

†Takes into account thinning expense only and not the other costs of production or of marketing.

‡Calculated from numbers of peaches in previous tables. The average number of peaches of Elberta per bushel was: 2¼ inches and over, 185; 2¼-2 inches, 215; 2-1¾ inches, 265; and 1¾ inches and under, 400.

§Labor @ 25¢ per hour.

thinning was $1.39, or only 9 cents more than that from the unthinned tree and $1.08 less than the average for early thinning. Following late thinning in 1931 size was not increased sufficiently to offset the reduction in yield when compared with no thinning, and the smaller expense of late thinning did not offset the greater returns from a higher amount of largest-sized fruits when compared with early thinning.

Profits were greater from early thinning and no thinning or late thinnnig than from different spacings at early thinning. The receipts per tree were greater with early 8-inch than from 4- or 6-inch thinning. The fact that 6-inch, early thinning ($2.25) did not rank between the 4- ($2.48) and the 8-inch ($2.89), early thinning was due likely to the higher yield (practically 1 bushel) on the tree thinned to 4-inch spacing. Also, in the late thinning, the comparatively low yield at the 8-inch spacing tended to some extent (see previous paragraph) to offset other factors in comparison with the results for the 4- and 6-inch spacings.

### RESULTS WITH TEN OTHER VARIETIES

Some of the varieties listed in Table 20 were thinned at a loss or at little gain in 1931 (aside from the prevention of limb breakage and the beneficial effects on yield and amount of large-sized fruit the next year). A number of varieties were of such small size that their suitability for commercial planting is questionable. They did not produce any of the largest-sized fruits (2¼ inches or larger), irrespective of whether the thinning was done early or late on the heavily overloaded trees. With these the cost of thinning proved prohibitive to profits.

**TABLE 20.—Expense and Receipts per Tree from 6-inch Thinning on 10 Varieties in a Year When the Set of Fruit was Heavy (1931)**
Planted 1923

| Variety | Time of thinning | Returns per tree from sale of fruit | | | | | | | | Thinning expense per tree | Net receipts per tree |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2¼ inches and over | | 2¼-2 inches | | 2-1¾ inches | | Total | | | |
| | | *Bu.* | *Dol.* | *Bu.* | *Dol.* | *Bu.* | *Dol.* | *Bu.* | *Dol.* | *Dol.* | *Dol.* |
| J. H. Hale | Early | 0.8 | 0.48 | 2.6 | 1.30 | 0.6 | 0.24 | 3.9 | 2.02 | 0.50 | 1.72 |
| | Late | 0.3 | 0.18 | 2.7 | 1.35 | 1.1 | 0.44 | 4.1 | 1.97 | 0.38 | 1.59 |
| Kirchner | Early | ..... | ..... | 0.3 | 0.15 | 0.9 | 0.36 | 1.2 | 0.51 | 1.50 | —0.99 |
| | Late | 0.02 | 0.01 | 0.6 | 0.18 | 0.8 | 0.32 | 1.4 | 0.51 | 0.50 | 0.01 |
| Salberta | Early | 0.02 | 0.01 | 1.3 | 0.65 | 1.6 | 0.64 | 2.9 | 1.30 | 0.75 | 0.55 |
| | Late | ..... | ..... | 1.1 | 0.55 | 2.0 | 0.80 | 3.1 | 1.35 | 0.38 | 0.97 |
| Brackett | Early | 0.1 | 0.06 | 3.3 | 1.65 | 1.9 | 0.76 | 5.3 | 2.47 | 1.00 | 1.47 |
| | Late | 0.01 | 0.01 | 0.9 | 0.45 | 1.4 | 0.56 | 2.3 | 1.02 | 0.31 | 0.71 |
| Early Elberta | Early | 0.04 | 0.02 | 2.4 | 1.20 | 1.9 | 0.76 | 4.3 | 1.98 | 0.75 | 1.23 |
| | Late | ..... | ..... | 0.4 | 0.20 | 1.8 | 0.72 | 2.2 | 0.92 | 0.31 | 0.61 |
| New Prolific | Early | ..... | ..... | 0.4 | 0.20 | 1.4 | 0.56 | 1.8 | 0.76 | 0.75 | 0.01 |
| | Late | ..... | .... | 0.2 | 0.10 | 1.1 | 0.44 | 1.3 | 0.54 | 0.44 | 0.10 |
| Banner | Early | ..... | ..... | 0.4 | 0.20 | 1.2 | 0.48 | 1.6 | 0.68 | 0.63 | 0.05 |
| | Late | ..... | ..... | 0.3 | 0.15 | 1.1 | 0.44 | 1.4 | 0.59 | 0.50 | 0.09 |
| Smock | Early | ..... | ..... | 0.3 | 0.15 | 1.0 | 0.40 | 1.3 | 0.55 | 0.88 | —0.33 |
| | Late | ..... | ..... | 0.1 | 0.05 | 0.6 | 0.24 | 0.7 | 0.29 | 0.50 | —0.21 |
| Fitzgerald | Early | ..... | ..... | 0.4 | 0.20 | 1.0 | 0.40 | 1.4 | 0.60 | 0.88 | —0.28 |
| | Late | ..... | ..... | 0.3 | 0.15 | 0.9 | 0.36 | 1.2 | 0.51 | 0.50 | 0.01 |
| Bronson | Early | ..... | ..... | 0.1 | 0.05 | 1.3 | 0.52 | 1.4 | 0.57 | 1.13 | —0.56 |
| | Late | ..... | ..... | 0.04 | 0.02 | 0.7 | 0.28 | 0.7 | 0.30 | 0.44 | —0.14 |

In the Variety Orchard (not including Elberta), the greatest returns per tree were obtained from J. H. Hale, Brackett, and Early Elberta, all three being members of the Elberta group of peaches. With these, the early thinning, although it required the most time and expense, proved the most profitable.

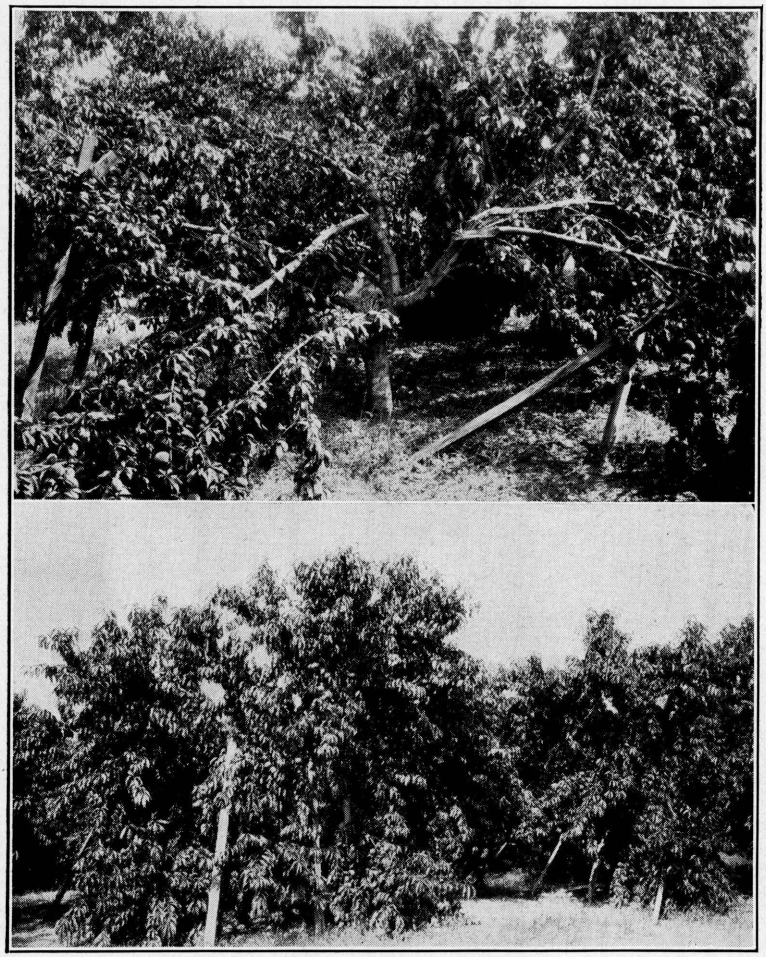

**Fig. 3.—Above—Much limb breakage occurred on the unthinned tree of Elberta with an exceptionally heavy load, even though a number of the branches were propped.**

**Below—Thinning combined with propping resulted in comparatively little limb breakage on the thinned Elberta trees.**

## *EXPERIMENTS IN A YEAR (1932) FOLLOWING CORRESPONDING DIFFERENTIAL TREATMENT THE YEAR PREVIOUS*

The results in 1932 require consideration not only with respect to the treatment in that year but to that in 1931 as well, because of the effects of thinning on the succeeding crop which have been discussed previously.

### RESULTS WITH ELBERTA

For the most part, the receipts from thinned trees were greater in 1932 than in 1931, because, although the crop was lighter and thinning expense less, the fruit not only sold for more but there was a demand for all of it.

In two cases, the receipts were less in 1932 than in 1931—namely, with the tree left unthinned and with the tree thinned late to 4-inch spacing. In both of these cases, the yield was comparatively low in 1932. It should be mentioned here that much limb breakage occurred in 1931 on the unthinned tree (even though 8.9 bushels were harvested from it in 1931). The factor of limb breakage in 1931 was also of some significance with respect to low yield in 1932 of the tree thinned late to 4-inch spacing over the 2-year period.

**TABLE 21.—Receipts per Tree with Elberta in 1932 from Thinning Following Corresponding Differential Treatment the Year Previous**

| Time of thinning | Yield | Fruit sold* | | | | | | | Thinning expense per tree† | Net receipts per tree‡ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2¾ inches and over–2¾ inches | | 2¼–2 inches | | 2 inches and under | | Total | | |
| | Bu. | Pct. | Dol. | Pct. | Dol. | Pct. | Dol. | Dol. | Dol. | Dol. |
| **Unthinned** | | | | | | | | | | |
| ..... | 0.8 | 94.4 | 0.94 | 5.6 | 0.06 | ..... | ..... | 1.00 | ..... | 1.00 |
| **4-inch thinning** | | | | | | | | | | |
| Early..... | 3.7 | 76.7 | 3.55 | 18.7 | 0.86 | 4.4 | 0.14 | 4.61 | 0.10 | 4.51 |
| Late..... | 0.8 | 88.0 | 0.70 | 10.9 | 0.09 | 1.1 | 0.01 | 0.80 | 0.01 | 0.79 |
| **6-inch thinning** | | | | | | | | | | |
| Early..... | 4.1 | 87.3 | 4.47 | 10.5 | 0.43 | 1.9 | 0.07 | 4.87 | 0.18 | 4.69 |
| Late..... | 1.8 | 90.8 | 2.04 | 6.5 | 0.12 | 2.5 | 0.03 | 2.19 | 0.05 | 2.14 |
| **8-inch thinning** | | | | | | | | | | |
| Early..... | 4.3 | 83.3 | 4.75 | 12.5 | 0.54 | 4.0 | 0.15 | 5.44 | 0.20 | 5.24 |
| Late..... | 1.9 | 91.7 | 2.18 | 7.5 | 0.14 | 0.8 | 0.01 | 2.33 | 0.08 | 2.25 |

*Sales were made at $1.25 per bushel for fruits both 2¾ inches up and 2¾-2¼ inches; $1.00 for 2¼-2 inches; and 85¢ for 2 inches down.
†Takes into account thinning expense only, not other costs of production or marketing.
‡Labor at 25¢ per hour.

In 1932 (keeping in mind that this is the second year of a repeat treatment) the effects on the receipts per tree were as follows: (a) Early thinning was more than four times as profitable as no thinning (average of $4.81 compared with $1.00); (b) early thinning was more than twice as profitable as late thinning (average of $4.81 compared with $1.73); (c) late thinning, with the

exception of the 4-inch spacing (where some unknown factor seems to be involved), was more than twice as profitable as no thinning; (d) profits increased as the spacing increased from 4- to 6- to 8-inch thinning, with both early and late thinning.

#### RESULTS WITH SEVEN VARIETIES

The receipts per tree were greatest in the Variety Orchard in 1932 where the thinning was done early. This is in accordance with the results with Elberta in 1932 and with the superiority of early thinning throughout the experimental work. It should be borne in mind, furthermore, that the results in 1932 have been affected by the treatment of the previous year.

**TABLE 22.—Receipts per Tree in 1932 from 6-inch Thinning of Seven Varieties Following Corresponding Differential Treatment the Year Previous**

| Variety | Time of thinning | Yield | Fruit sold* | | | | | | | Thinning expense per tree | Net receipts per tree |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2¼ in. and over-2 in. | | 2-1¾ inches | | 1¾ inches and under | | Total | | |
| | | *Bu.* | *Pct.* | *Dol.* | *Pct.* | *Dol.* | *Pct.* | *Dol.* | *Dol.* | *Dol.* | *Dol.* |
| Salberta | Early | 5.0 | 91.9 | 4.60 | 7.5 | 0.32 | 0.6 | 0.02 | 4.94 | 0.38 | 4.56 |
| | Late | 3.0 | 99.3 | 2.98 | 0.7 | 0.02 | 0.0 | ..... | 3.00 | 0.08 | 2.92 |
| Early Elberta | Early | 6.8 | 81.4 | 5.74 | 13.4 | 0.77 | 5.2 | 0.27 | 6.78 | 0.44 | 6.34 |
| | Late | 3.3 | 86.1 | 2.84 | 10.9 | 0.31 | 3.0 | 0.07 | 3.22 | 0.08 | 3.14 |
| New Prolific | Early | 5.3 | 62.6 | 3.32 | 29.7 | 1.34 | 7.7 | 0.31 | 4.97 | 0.38 | 4.59 |
| | Late | 3.8 | 88.4 | 3.36 | 8.8 | 0.28 | 2.8 | 0.08 | 3.72 | 0.13 | 3.59 |
| Banner | Early | 4.3 | 87.2 | 3.75 | 9.5 | 0.35 | 3.3 | 0.11 | 4.21 | 0.38 | 3.83 |
| | Late | 3.8 | 86.2 | 2.28 | 10.8 | 0.35 | 3.0 | 0.09 | 3.72 | 0.21 | 3.51 |
| Smock | Early | 5.3 | 76.0 | 4.01 | 20.3 | 0.91 | 3.7 | 0.15 | 5.07 | 0.69 | 4.38 |
| | Late | 3.0 | 59.5 | 1.79 | 33.4 | 0.85 | 7.1 | 0.16 | 2.80 | 0.13 | 2.67 |
| Fitzgerald | Early | 2.3 | 91.3 | 2.10 | 7.8 | 0.15 | 0.9 | 0.02 | 2.27 | 0.13 | 2.14 |
| | Late | 0.6 | 87.0 | 0.52 | 12.8 | 0.06 | 0.2 | 0.01 | 0.59 | 0.01 | 0.58 |
| Carman | Early | 5.8 | 96.6 | 5.60 | 3.4 | 0.17 | 0.0 | ..... | 5.77 | 0.13 | 5.64 |
| | Late | 7.5 | 84.3 | 6.32 | 13.1 | 0.84 | 2.6 | 0.15 | 7.31 | 0.33 | 6.98 |

One exception to greatest profits from early thinning occurred with the Carman variety. It will be recalled that records were not kept on this variety in 1931. It seems highly possible that the superiority of late thinning on this variety in 1932 is due at least as much if not more to an unknown factor which might be clear if records were available for the 2-year period than to a varietal factor. With Carman in 1933, early thinning was more profitable than late thinning because the yields were 6.8 bushels and 2.0 bushels, respectively.

### *THINNING COST PER BUSHEL*

#### RESULTS WITH ELBERTA

Thinning expense was less for late thinning than for early thinning because less time was required per tree (See Table 17). In 1931, the thinning cost per harvested bushel of Elberta ranged from 6.3 to 9.3 cents when the work was done early, and from 2.9 to 4.7 cents when the work was done late, Table 23. Because of adverse marketing conditions which prevailed in 1931, all of the fruit was not sold. For this reason, thinning expense when based

on bushel *sold* was higher than when based on bushel *harvested.* Although not indicated in the table, it has been calculated that the thinning expense based on bushel sold ranged from 8.3 to 10.9 cents for early thinning and from 5.3 to 8.6 cents for late thinning.

**TABLE 23.—Thinning Cost per Bushel**

| Variety | Time of thinning | Spacing | Cost per bushel | |
|---|---|---|---|---|
| | | | 1931 | 1932 |
| | | *In.* | *Ct.* | *Ct.* |
| Elberta | Unthinned | None | ..... | ..... |
| | Early | 4 | 6.3 | 2.7 |
| | Late | 4 | 2.9 | 1.3 |
| | Early | 6 | 9.2 | 4.4 |
| | Late | 6 | 3.7 | 2.8 |
| | Early | 8 | 7.8 | 4.6 |
| | Late | 8 | 4.7 | 4.2 |
| J. H. Hale | Early | 6 | 7.7 | ..... |
| | Late | 6 | 5.8 | ..... |
| Kirchner | Early | 6 | 14.9 | ..... |
| | Late | 6 | 8.2 | ..... |
| Salberta | Early | 6 | 8.9 | 7.6 |
| | Late | 6 | 3.7 | 2.7 |
| Brackett | Early | 6 | 10.5 | ..... |
| | Late | 6 | 4.8 | ..... |
| Early Elberta | Early | 6 | 8.7 | 6.5 |
| | Late | 6 | 4.3 | 2.4 |
| New Prolific | Early | 6 | 10.6 | 7.2 |
| | Late | 6 | 9.2 | 3.5 |
| Banner | Early | 6 | 9.7 | 8.8 |
| | Late | 6 | 6.5 | 5.5 |
| Smock | Early | 6 | 13.5 | 13.0 |
| | Late | 6 | 8.2 | 4.3 |
| Fitzgerald | Early | 6 | 10.5 | 5.6 |
| | Late | 6 | 7.3 | 1.7 |
| Bronson | Early | 6 | 13.3 | ..... |
| | Late | 6 | 7.1 | ..... |
| Carman | Early | 6 | ..... | 2.3 |
| | Late | 6 | ..... | 4.4 |

In 1932, due largely to a lighter set of fruit, the thinning expense was less than in 1931. With Elberta, it ranged from 2.7 to 4.6 cents per bushel at early thinning and from 1.3 to 4.2 cents for late thinning.

### RESULTS WITH OTHER VARIETIES

The trees in the Variety Orchard were mostly 3 years older than those in the Elberta Orchard, which helps to account for the greater cost for the other varieties than for Elberta. However, even more significant are the facts that (a) the actual time of early thinning varied (the earlier it was done, the greater the expense); and (b) the cost of thinning varied to an appreciable extent because of differences between varieties.

Regardless of the factors affecting the results in 1931 the cost of thinning ranged in the varieties from 7.7 to 14.9 cents for early thinning and from 3.7 to 8.2 cents for late thinning. As shown in a previous table, the expense of thinning, under the prevailing marketing conditions, was prohibitive to profits with some of the varieties. Profits from thinning in the current season of 1931 resulted, for the most part, only with members of the Elberta group, such as J. H. Hale, Brackett, and Early Elberta.

In 1932, the expense per bushel ranged from 2.3 to 13.0 cents for early thinning and from 1.7 to 5.5 cents for late thinning. The tree of Smock is naturally larger in habit than is that of the other varieties, which largely accounts for the longer time required to thin and the subsequent higher cost per bushel.

In both years, as with Elberta, thinning cost was more when done early than when done late (except with Carman where an unknown factor in 1931 seems to be involved).

**Fig. 4.—The sizing machine used in the experimental work, the fruit being divided into four sizes (blemished fruit was sized separately from the sound fruit). The largest size in 1931 was 2¼ inches and more; in 1932, the largest size was 2¾ inches and over and the second size was based on a ½-inch instead of the usual ¼-inch difference.**

## SUMMARY

The experiments which form the basis of this report were conducted in 1931 with Elberta and 11 other varieties of peaches, in 1932 with Elberta and seven other varieties, and in 1933 with Carman. They have shown certain effects of thinning both (a) in the current year of the work, when a heavy set of fruit followed a year in which the trees did not bear a crop, and (b) in the succeeding year, when the set of fruit on various trees differed strikingly, due to the influence of the previous year's treatment. The results concerning the effects on the succeeding crop have been associated with the fact that each tree receiving a certain thinning treatment in the first year of the work received a corresponding treatment the next year. During the 2 consecutive years, the same Elberta tree was left unthinned and other trees were thinned early or late to guide spacings of 4, 6, or 8 inches. As used here, *early thinning* refers to thinning done near the middle of June (just before or soon after the start of the "June drop"), and *late thinning* refers to that done near mid-July (soon after most of the "June drop" peaches had fallen).

### *EFFECT ON YIELD AND SIZE IN A YEAR WHEN THE SET OF FRUIT WAS HEAVY*

1. All thinning treatments, when averaged, reduced the yield per tree below that of the unthinned tree.

2. Very early thinning, by causing the retention of a certain number of desirably located fruits which otherwise would have dropped, resulted in less reduction in yield than later thinning.

3. The percentage and quantity per tree of the largest-sized fruit (2¼ inches or more) increased with early thinning (a) when the guide spacing was increased from 4 to 6 to 8 inches and (b) when the percentage of peaches removed per tree was increased. Late thinning did not result in a corresponding increase; hence, early thinning was the most influential factor in securing large-sized fruit.

4. Both early and late thinning decreased the percentage of fruit in the smallest sizes. Early thinning reduced the percentage of small peaches more than did late thinning.

5. With practically all the varieties, even when the percentage of large fruit was not high or the differences in results between treatments always marked, the highest percentage of the two largest sizes of fruit occurred when thinning was done early.

6. The effect of early thinning on size of fruit was sufficient, in a number of cases, to result in fewer peaches per bushel (with a resulting larger size) and also in a higher yield per tree than from late thinning.

## *EFFECT ON YIELD AND SIZE FROM THINNING FOLLOWING CORRESPONDING DIFFERENTIAL TREATMENT THE YEAR PREVIOUS*

7. In the second year of the work, due chiefly to influences following corresponding differential thinning the year previous, the Elberta trees thinned early produced twice as much fruit as those thinned late and four times as much as the tree left unthinned. With the other varieties, the early-thinned trees outyielded the late-thinned trees in the second year.

8. The lighter the yield per tree, the higher was the percentage of largest-sized fruits (2¾ inches and over). However, because of the larger yield per tree associated with the cumulative effect from the previous year's treatment, the early-thinned trees produced more large fruit than the late-thinned trees and the late-thinned trees outyielded the unthinned tree.

9. In no case was size increased sufficiently to cause in itself the striking increase in yield that accompanied the early thinning.

## *COSTS AND RECEIPTS*

10. Early thinning was more expensive than late thinning. Only about half as much time was required for the late thinning as for the early. The chief reason for the reduction in time required for the late thinning was that fewer fruits were removed, due to the June drop.

11. On a given date, thinning to 4-inch spacing was slightly quicker than thinning to 8-inch spacing, because the latter required the removal of more fruits. Other than this, there was not much difference in the time required for the 4-, 6-, or 8-inch spacing, providing the work was done on trees of the same size and the dimensions of the developing fruits were the same. The time required on a given date varied with the workmen or the variety more than with the distance of spacing.

12. In 1931 when the market demand was critical, a greater amount of fruit was sold at a higher price from each thinned tree than from the higher yielding unthinned tree, because of the larger size of fruit. The early thinning, although involving the most expense, about doubled the receipts over those resulting from no thinning. With late thinning in this year, when the set was heavy, (a) the receipts per tree were only slightly more than those from no thinning, (b) size was not increased sufficiently to offset the reduction in yield when compared with no thinning, and (c) the lower expense of late thinning did not offset the greater returns from a greater quantity of largest-sized fruits when compared with early thinning.

13. When the set of fruit was heavy, the receipts with Elberta were greater from early, 8-inch than from early, 4- or 6-inch spacing. However, the returns were higher for early thinning, when compared with late thinning or no thinning, than they were for different spacings.

14. Among the varieties (aside from Elberta) the highest receipts per tree were obtained from J. H. Hale, Brackett, and Early Elberta, all three being members of the Elberta group. With these, as with Elberta, the early thinning, although it required the most time and expense, proved the most profitable when the set was heavy.

15. The results in the year following the heavy crop were as follows with Elberta: (a) Early thinning was more than four times as profitable as no thinning; (b) early thinning was more than twice as profitable as late thinning; (c) late thinning was about twice as profitable as no thinning; and (d) profits increased as the spacing increased from 4- to 6- to 8-inch spacing at both late and early thinning.

16. Thinning expense per harvested bushel of Elberta ranged from 6.3 to 9.3 cents for early thinning and from 2.9 to 4.7 cents for the late, when the set of fruit was heavy. The succeeding year, it ranged from 2.7 to 4.6 cents per bushel at early thinning and from 1.3 to 4.2 cents for late thinning.

### *STUDIES ON GUIDE DISTANCE OF THINNING*

17. Of several guide spacings considered, that one involving the distance along the wood between two consecutive fruiting points on the same branchlet plus the distance measured along the wood and around the crotch in V-shaped manner between the fruiting point of a peach on one branchlet to the nearest peach on an adjacent branchlet seemed the most reliable as a usable index in this thinning work.

18. The actual spacing of the fruits after thinning exceeded the guide distances of 4, 6, and 8 inches by an average of approximately 2 inches in each case. Thinning to 8-inch spacing did not result in the removal of twice as many peaches from the tree as 4-inch spacing, because even with a heavy set of fruit the peaches proved to be by no means uniformly spaced when thinned to a given guide distance.

19. Only approximately one-third of the measurements between peaches were at spacings of the desired 4, 6, or 8 inches, respectively. A fairly high percentage (about 20 per cent) of the peaches on the trees was located so far apart that thinning to 4, 6, or 8 inches did not affect the spacing between them. The greater the guide spacing, the lower was the percentage of fruits remaining at the closest distances on the tree.

## PRACTICAL CONSIDERATIONS

Early thinning is recommended for Elberta, when conditions approximate those under which the experiments were conducted. These conditions included a year when the set of fruit was heavy, the trees were highly subject to limb breakage and trunk splitting, the fruit was smaller than normal, large fruit brought a premium over small fruit, and tree exhaustion was a factor in its effect on the succeeding crop. Early thinning proved the most beneficial and profitable in a year when thinning was a particularly acute matter, even though twice as long (and thus greater expense) was required to thin early than to thin late and the selling price per bushel of the fruit was low; the benefits were accentuated the succeeding year.

This study has emphasized certain advantages of early thinning. However, so many factors are involved, and thinning, other practices, environmental conditions, varietal differences, and many other matters are interrelated so much that, at the present time, no rule-of-thumb can be given properly which will fulfill thinning requirements for the great variety of conditions

under which peaches are grown. Early thinning will not always be the most profitable procedure and seldom, if ever, will it be done the most quickly; yet the evidence seems to indicate that when the set of fruit is very heavy, as in 1931, late thinning (even though it may be the best practice in many years) may be inadequate to give the desired response on size of fruit, prevention of tree exhaustion, and in certain other respects.

Although winterkilling of peach buds precludes cumulative effects in many years from thinning, the fact that the set of fruit varies greatly from year to year emphasizes certain features found in these experiments. It will be recalled that the first year of this work followed a year of crop failure with Elberta at Wooster. The sequence of little or no fruit, a heavy set, and then a lighter crop, such as occurred during the course of these experiments, is not uncommon in peach orchards throughout Ohio. A number of peach growers in the State who thinned "late" in 1931, when the set of fruit was heavy, have told the writer that the results were not so satisfactory as could be desired, especially with respect to improving the size of fruit. Their experience is in accordance with the results from late thinning in these experiments in that year which showed the need for early thinning for best results.

The results obtained in these experiments indicate that thinning should properly be regarded as more than a one-year proposition. The previous history of behavior of the trees should be considered when evaluating thinning responses; for example, without the information gained in 1931 in this work the results of 1932 would be misleading because they were greatly influenced by the thinning treatment of the previous year. The work with Carman which continued into 1933, a year when only the hardiest varieties bore a crop, furnishes additional evidence on this point.

With certain varieties which were not included in this work (because trees of full-bearing age were not available at the time) the advisability of thinning early may be desirable even more frequently than may be the case with Elberta. For example, Golden Jubilee ripens considerably earlier (hence with a shorter fruit development period) than Elberta; its fruit is smaller than that of Elberta. Certain other varieties, such as Rochester, are not only earlier and of smaller size than Elberta, but they are also much hardier and more prone to fruit heavily. It would seem logical to assume that the advantages shown for early thinning of Elberta would be striking in many years in the case of varieties with characteristics exemplified by Golden Jubilee and Rochester.

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